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REPORT 13102R1

Revision 1

Revised DA Acoustic Assessment
Proposed Mixed Use Residential Development
Cnr Merrylands Road, Addlestone Road
& Burford Street, Merrylands

PREPARED FOR:
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13 December 2013

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DA Acoustic Assessment
Proposed Mixed Use Residential Development
Cnr Merrylands Road, Addlestone Road
& Burford Street, Merrylands

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13102R1	Revision 0	29 October 2013	Raymond Sim	Rodney Stevens	Rodney Stevens
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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (here forth referred to as RSA) has been engaged by NR Complex Pty Ltd to prepare a Development Application (DA) Acoustic Assessment for the proposed mixed use residential development at cnr Merrylands Road, Addlestone Road & Burford Street, Merrylands, NSW.

This report addresses the following noise impacts relating to the proposed development:

- existing road traffic noise from Merrylands Road on the amenity of the proposed residential development;
- proposed external mechanical services plant on the amenity of neighbouring residences;
- vehicle movement at proposed retail loading dock on neighbouring residences; and
- increased traffic movements on surrounding roads resulting from the development on neighbouring residences.

This report will form part of the Development Application submission to Holroyd City Council.

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 development site is bounded by Merrylands Road to the north, Addlestone Road to the east, Burford Street to the west, and residential apartment buildings to the south.

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

Figure 2-1 Site Location

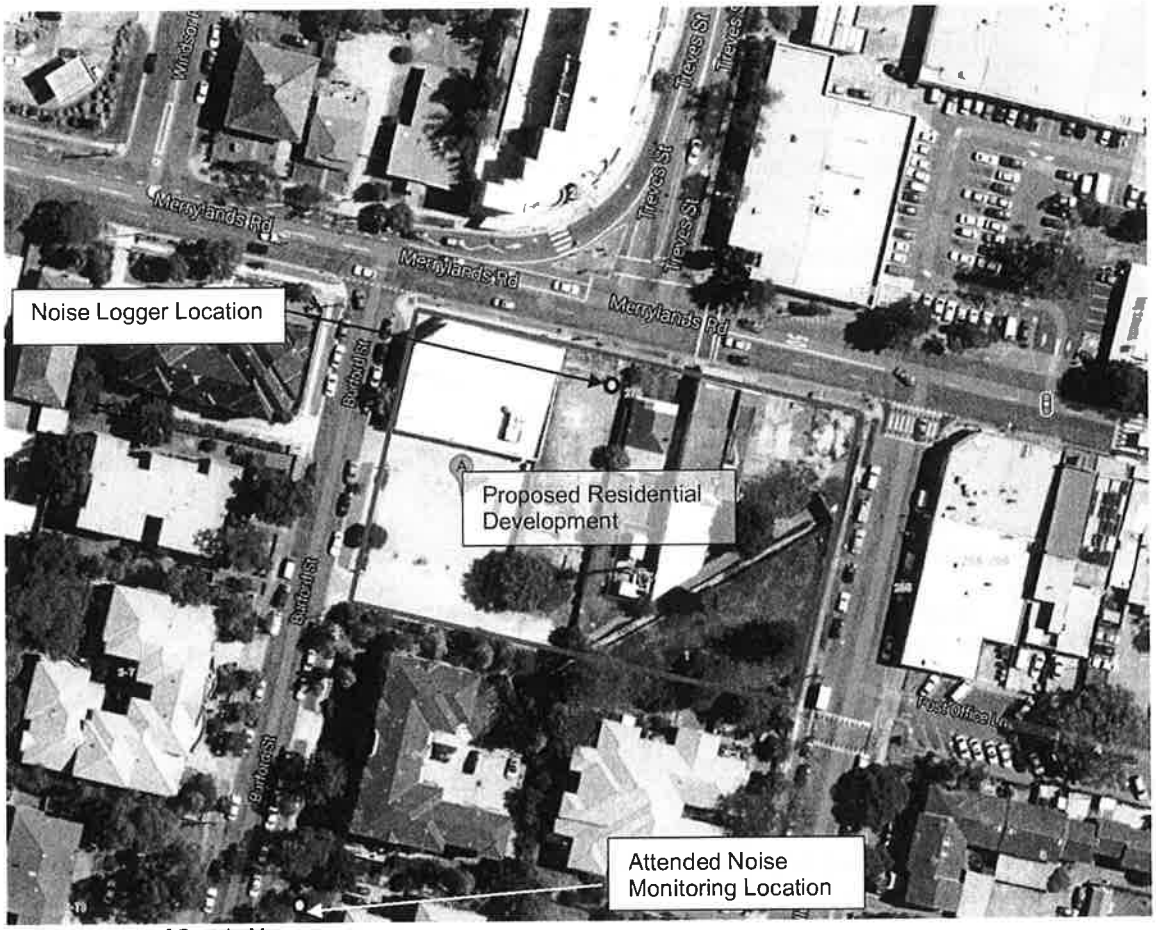
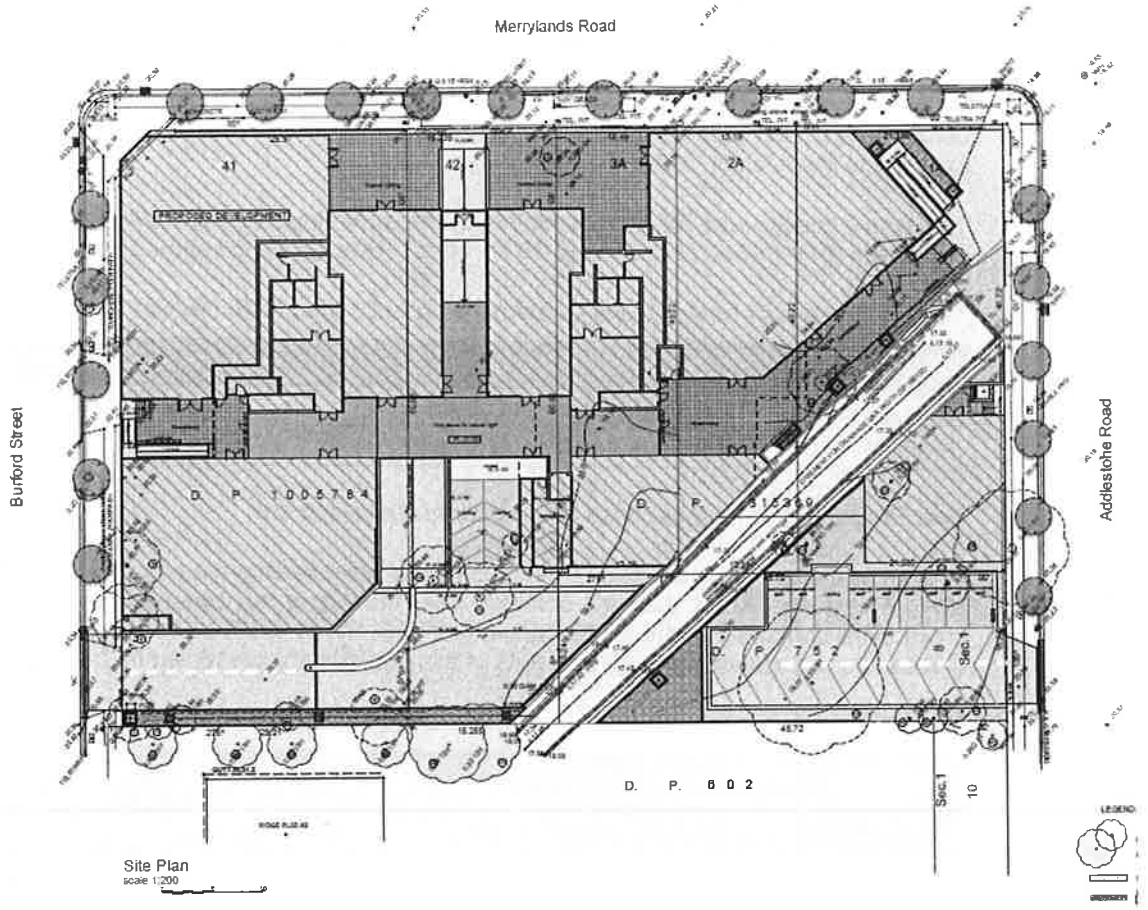


Image courtesy of Google Maps

2.2 Site Plan

The proposal is to construct a mixed used retail and residential building consisting of a ten (10) above ground levels and two (2) basement car park levels at the project site. The ground level will consists of four (4) retail spaces and levels 1 to 9 will consist of residential apartments. Figure 2-2 below is a site plan of the proposed development.

Figure 2-2 Site Plan



3 BASELINE NOISE SURVEY

3.1 Unattended Noise Monitoring

In order to characterise the existing acoustical environment of the area adjacent to Merrylands Road unattended noise monitoring was conducted between the dates of Wednesday 10 July and Wednesday 17 July 2013 at the logging location shown in Figure 2-1. The logger location is representative of the northern façades of the proposed residential apartments to Merrylands Road.

Logger location was 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 a RION NL-42 environmental noise logger (serial number 133010) fitted with microphone windshields. Calibration of the logger 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.

3.1.1 Data Processing to Assess Noise Intrusion into Development

To assess noise intrusion into the proposed residential apartments, the data obtained from the Logger Location has been processed to establish representative ambient noise levels at the facades most exposed to Merrylands Road.

The time periods used for this assessment are as defined in the NSW Environmental Protection Authority's (EPA) *Road Noise Policy* (RNP, 2011). Results are presented below in Table 3-1.

Table 3-1 Ambient Noise Levels Corresponding to Defined RNP Periods

Location	Period	External Noise Levels dB(A)
Logger Location	Day Time 7:00 am - 10:00 pm	67 $L_{Aeq(1hour)}$
	Night Time 10:00 pm - 7:00 am	65 $L_{Aeq(1hour)}$

3.1.2 Data Processing to Assess Noise Emission from Development

In order to assess noise emission from mechanical plant serving the proposed development to residences along Merrylands Road, the data obtained from the logger has been processed in accordance with the procedures contained in the EPA's Industrial Noise Policy (INP) to establish representative noise levels that can be expected on site. The results of this analysis are presented in Table 3-2.

Table 3-2 Measured Ambient Noise Levels Corresponding to Defined INP Periods

Location	Measurement Descriptor	Measured Noise Level – dB(A) re 20 µPa		
		Daytime 7.00 am - 6.00 pm	Evening 6.00 pm - 10.00 pm	Night-time 10.00 pm - 7.00 am
Logger Location	L_{Aeq}	66	64	61
	RBL (Background)	55	52	41

3.2 Short-term Attended Noise Monitoring

In order to characterise the existing acoustical environment of the area to the south of the development site, away from Merrylands Road, short-term attended noise monitoring was conducted on Wednesday 11 December 2013 at the attended noise monitoring location shown in Figure 2-1. The attended noise monitoring location is representative of the noise environment of adjoining residences to the south of the development site.

The monitoring location was selected with consideration to other noise sources which may influence readings, and gaining permission for access from residents and landowners.

Attended noise measurements were performed using Svantek SVAN 971 Type 1 Precision Sound Level Meter (serial number: 28280). Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding the acceptable variation of ±0.5 dB(A) (AS 1055).

The acoustic instrumentation (SLM and calibrator) employed throughout the monitoring program was designed to comply with the requirements of AS 1259.2-1990, "*Sound Level Meters*" and carry current NATA or manufacturer calibration certificates.

In order to assess noise emission from mechanical plant serving the proposed development to residences along Merrylands Road, the data obtained from the logger has been processed in accordance with the procedures contained in the EPA's Industrial Noise Policy (INP) to establish representative noise levels that can be expected on site. The results of this analysis are presented in Table 3-2.

Table 3-3 Measured Ambient Noise Levels Corresponding to Defined INP Periods

Location	Time	Measured Noise Level dB(A), 15min		Comment
		L_{Aeq}	L_{A90}	
4-8 Burford Street	11:14 am to 11:29 am (Daytime)	54	44	Road traffic passby on Burford Street: 61-68 Distant road traffic on Merrylands Road: 47-51 Birds: 57-63 People walking by and talking: 60-65 S.S: 44-45
	9:22 pm to 9:37 pm (Evening)	52	43	Road traffic passby on Burford Street: 59-73 Distant road traffic on Merrylands Road: 47-56 People walking by and talking: 58-60 S.S: 42-43
	1:06 am to 1:21 am (Night-time)	50	38	Road traffic passby on Burford Street: 60-69 Distant road traffic on Merrylands Road 46-52 S.S 38-39

Notes: values expressed as dB(A) and rounded to nearest 0.5 dB(A); SS observed Steady State 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 present for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

4 NOISE CRITERIA

4.1 Holroyd DCP Noise Criteria

Requirements for road traffic noise intrusion into residential spaces are detailed in the Holroyd City Council's *"Holroyd Development Control Plans 2013"* Part B – Residential Controls in Clauses C11 is reproduced below:

> *Where a property is adjacent to a railway or arterial road, an acoustic report conducted by a suitably qualified acoustic consultant is required to be submitted to Council. The acoustic report shall provide measurements of noise impacts upon proposed dwellings and make specific recommendations for the attenuation of noise to currently recognised levels conductive to reasonable residential amenity. Compliance with the maximum design sound levels recommended by Australian Standard 2107:200 Acoustic – Recommended design sound levels and reverberation times for building interiors, as follows –*
>
> - *Recreation areas – 40 dB(A),*
> - *Sleeping Areas – 35 dB(A), and*
> - *Other habitable rooms – 40 dB(A).*

4.2 Industrial Noise Policy Criteria

The mechanical plant and loading bay & commercial car park vehicle movement associated with the proposed development has the potential to adversely impact on the acoustic amenity of nearby noise-sensitive receivers. Therefore, appropriate noise criteria to assess the development's external mechanical plant noise emission have been established based on the EPA's INP.

The DEC oversees the Industrial Noise Policy (INP), released by the EPA in January 2000 which provides a framework and process for deriving noise criteria. The INP criteria for industrial noise sources (eg mechanical plant) have two (2) 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.

4.2.1 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}) of the source should not be more than 5 dB(A) above the measured Rated Background Level (RBL), over any 15 minute period.

4.2.2 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 value, then noise levels from new industrial-type noise sources, (including air-conditioning mechanical 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

4.2.3 Area Classification

The INP classifies the noise environment of the subject area as "Urban". The INP characterises the "Urban" noise environment as an area that:

- Is dominated by "urban hum" or industrial source noise.
- Has through traffic with characteristically heavy and continuous traffic flows during peak periods.
- Is near commercial districts or industrial districts.
- Has any combination of the above.

4.2.4 Project Specific Noise Emission 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, because, in this case, the noise environment at the monitoring site used to establish industrial noise criteria is not controlled by industrial type noise sources, (it is largely aggregate urban hum and distant road traffic noise), the project specific noise levels, which are shown in bold in Table 4-1, are the lower of the amenity and intrusive criteria.

Table 4-1 Criteria for Industrial Noise Emissions to Nearby Residences

Time of Day	Noise Level dB(A) re 20 µPa				
				INP Criteria	
				Intrusive	Amenity
	ANL[1] (period)	Measured RBL $L_{A90,15minute}$[2]	Measured $L_{Aeq,15minute}$	$L_{Aeq,15minute}$ Criterion for New Sources	$L_{Aeq,Period}$ Criterion for New Sources3
Nearby Residences along Merrylands Road					
Day	60	55	66	60	**56**
Evening	50	52	64	57	**54**
Night	45	41	61	**46**	51
Adjoining Residences south of Project Site					
Day	60	44	54	**49**	59
Evening	50	43	52	48	**42**
Night	45	38	50	43	**40**

Note 1: ANL Acceptable Noise Level for an urban 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

4.3 Sleep Disturbance Criteria

In order to minimise the risk of sleep disturbance from short duration noise events associated with the proposed development, such as vehicular movements at the loading bay and commercial car park on site during night-time hours, the *Environmental Noise Control Manual (ENCM)* (EPA 1985) recommends that:

> *The $L_{A1\ (60second)}$ noise level outside a bedroom window should not exceed the L_{A90} background noise level by more than 15 dB(A) during night-time period (10.00 pm to 7.00 am). The $L_{A1\ (60second)}$ noise level may conservatively be estimated by the typical maximum level of noise emission.*

The Application Notes for the INP state that whilst the abovementioned criterion is not ideal, in the absence of any more suitable alternative, the EPA will continue its use as a guide to determine the likelihood of sleep disturbance.

The *Environmental Criteria for Road Traffic Noise (ECRTN)* (Environment Protection Authority NSW 1999) provides additional guidance as to the likelihood of sleep disturbance and points out the following:

> *"There is no universally accepted criterion governing the likelihood of sleep disturbance. In other words, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance (for all or even a majority of people)."*

The ENCM guideline takes into account emergence of noise events, but does not directly limit the number of such events or their peak level, which are also found to affect sleep disturbance.

The ECRTN and RNP includes a review of international sleep disturbance research and concludes 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."*

The conclusion is specific to noise levels internally, and takes into consideration the frequency of noise events.

A standard building construction with no special acoustic treatment measures to the facade would typically attenuate noise by 20 dB(A) with the windows closed. In accordance with the ECRTN, this would derive that maximum *external* noise levels at a building façade between 70-75 dB(A) are unlikely to awaken people from sleep.

This level range has been applied herein as a screening assessment for potential sleep disturbance upon surrounding residential receivers.

4.4 Road Noise Policy Criteria

It is predicted by Thompson Stanbury Associates (Project Traffic Consultant) that road traffic on surrounding roads with increase due to the proposed development. Therefore, assessment of road traffic noise impact on existing residences due to additional traffic on Merrylands Road and surrounding local road will be required.

The EPA Road Noise Policy (RNP, 2011) provides the accepted criteria for limits on operational road noise (see Table 4-2). Merrylands Road is classified as a sub-arterial road, and Burford Road, Addlestone Road and Newman Street are classified as local road. The proposed development would create additional traffic on existing roads and therefore falls under the requirements listed in the below table.

The noise goals should aim to be achieved at project opening and 10 years after project opening. The RNP relative increase criteria assess any increase in the total traffic noise level at a receiver due to the proposed project. The relative increase criteria is exceeded if the 'build option' noise levels increase by more than 12 dB(A) above the 'no-build option' noise levels. The 12 dB(A) relative increase criteria are not applicable to local roads. The RNP requires residential receivers to be considered 600 metres from the road centre line for the assessment of the relative increase criteria, which is applicable to this proposal.

Residences experiencing exceedances of the road traffic noise assessment criteria or the relative increase criteria should be considered for mitigation measures. However, it should be noted that the RNP also recognises "in assessing feasible and reasonable mitigation measures an increase of up to 2 dB(A) represents a minor impact that is considered barely perceptible to the average person".

Table 4-2 RNP Noise Assessment Criteria for Residential Land Use

Road Category	Type of Project	Noise Assessment Criteria – dB(A)		Relative Increase Criteria – dB(A)	
		Day (7 am – 10pm)	Night (10pm – 7am)	Day (7 am – 10pm)	Night (10pm – 7am)
Freeway / Arterial / Sub-Arterial Roads	Existing residence affected by additional traffic on existing freeway / arterial / sub-arterial roads generated by land use developments	$L_{Aeq\ (15\ hour)}$ 60 (external)	$L_{Aeq\ (9\ hour)}$ 55 (external)	Existing traffic $L_{Aeq\ (15\ hour)}$ +12 dB	$L_{Aeq\ (9\ hour)}$ +12 dB (external)
Local Roads	Existing residence affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq\ (1\ hour)}$ 55 (external)	$L_{Aeq\ (9\ hour)}$ 50 (external)	-	-

5 ROAD TRAFFIC NOISE INTRUSION ASSESSMENT

5.1 Predicted Road Traffic Noise Intrusion

This assessment predicts road traffic noise intrusion from Merrylands Road to the proposed residential component of the development.

Standard window glazing of a building will typically attenuate these noise levels by 20 dB(A) with windows closed and 10 dB(A) with windows open (allowing for natural ventilation). The predicted internal noise levels of the proposed residential apartments are presented in Table 5-1 for the windows open and windows closed scenarios. Standard window system (4 mm thick glass with aluminium frame) has been assumed for this prediction.

Table 5-1 Predicted Internal Road Traffic Noise Levels - Standard Glazing

Type of Occupancy	Descriptor	Internal Noise Level		Noise Criteria
		Windows Open	Windows Closed	
Living Areas (Daytime)	$L_{Aeq,15hour}$	57 dB(A)	47 dB(A)	40 dB(A)
Living Areas (Night time)	$L_{Aeq,9hour}$	55 dB(A)	45 dB(A)	40 dB(A)
Sleeping Areas (Night time)	$L_{Aeq,9hour}$	55 dB(A)	45 dB(A)	35 dB(A)

The predicted internal noise levels indicate that road traffic noise impact on the proposed residential apartments will potentially exceed the noise criteria with windows opened and closed. When windows are opened, road traffic noise in the Living Areas and Sleep Areas will exceed the criteria by up to 17 dB(A) and 20 dB(A) respectively. When windows are closed, road traffic noise in the Living Areas and Sleep Areas will exceed the criteria by up to 7 dB(A) and 10 dB(A) respectively.

5.2 Noise Control Recommendations

Based on the above predicted road traffic noise impacts (refer Table 5-1) the following noise control measures are recommended for the residential units which have a line of sight of Merrylands Road:

- Windows and doors in the facade of residential units facing or with line of sight of Merrylands Road will need to be closed to meet internal noise levels. Therefore, alternative ventilation methods which meet the ventilation requirements of the BCA and Australian Standard AS 1668.2:2002 will be required and design input should be sought from an appropriately qualified mechanical services consultant.
- Based on the predicted internal noise levels, residential units facing or with line of sight of Merrylands Road should have the following minimum Rw rating as indicated in Table 5-2 below.

Table 5-2 In-principle Glazing Recommendations

Location	Glazing Type	Minimum Glazing Rw Rating	Indicative Glazing System
Living Rooms	Sliding Door	Rw 33	10.38 mm laminated glass in acoustically sealed frame*
Bedrooms	Sliding Door	Rw 33	10.38 mm laminated glass in acoustically sealed frame*
	Sliding Window	Rw 31	6.38 mm laminated glass in acoustically sealed frame*

Note *: glazing system are for reference only. Any glazing system to be installed for the development is to achieve the minimum Rw rating indicated above.

Please note Rw ratings provided in Table 5-2 rely on the acoustic performance of the window glazing and frame. Rw ratings should be checked with glazing manufacturers and frames should be selected and installed as to not degrade the performance of the glazing. It is also recommended that glazing specifications are reviewed at the detailed design stage, most notably if changes to the glazing area are made throughout the design.

External glazing with no line of sight to Merrylands Road may be of standard 4 mm glass in regular aluminium frame.

6 INDUSTRIAL NOISE EMISSION ASSESSMENT

6.1 External Mechanical Plant Noise Impact

Details of mechanical plant have not yet been confirmed for the development at this stage of the project. Any such plant will require review and assessment at the detailed design stage of the project to ensure compliance with the criteria as stipulated in Section 4.2. However, it is envisaged that conventional engineering solutions such as the implementation of silencers and/or barriers would enable the recommended criteria to be achieved. The selection of the quieter mechanical plant, plant locations and the orientation of exhaust outlets will also assist the project in achieving the INP criteria.

Given the distances between the location of the proposed development and the surrounding potentially residential receivers it is recommended, where possible and feasible, that external mechanical plant should be located on the roof of the proposed building along the northern (Merrylands Road) boundary, away from the southern boundary of the building. Exhaust outlets are recommended, where possible and feasible, to be orientated away from residences to the south of the development site, preferably facing north toward Merrylands City Centre.

6.2 Loading Dock Vehicle Movements Noise Emission

Truck noise level data measured by RSA personnel at a similar facility have been employed when assessing noise impacts from on-site truck movements. The corresponding overall noise levels used in our calculations are detailed as follows:

- B-Double Truck Engine – L_{Aeq} 78 dB(A) when measured at a distance of approximately 5 metres for a duration of 45 seconds.
- Truck Reversing Alarm – Maximum sound power level (SWL) of 104 dB centred at 1 kHz.

Based on 2 bays at the loading dock it is assumed that no more than two truck attends site at a time. This corresponds to a maximum of two truck movements per 15 minute period. The corresponding $L_{Aeq(15minute)}$ noise level is therefore 68 dB(A).

Calculations of truck engine noise, taking into account 5 dB attenuation afforded by distance, yield a resultant noise level at adjoining southern residential receivers on the ground floors in the order of 63 dB(A). Resultant L_{Amax} noise levels due to reversing alarms at the nearest residential bedroom window have been calculated to be in the order of 70 dB(A). Both of these predicted noise levels are found to be in excess of the relevant noise criteria as stipulated in Sections 4.2 and 4.3.

6.3 Commercial Car Park Noise Emission

Noise will be generated by car-related events associated with cars arriving and leaving the outdoor commercial car park located at south east corner of site. Typical sound power levels for low speed vehicle activities are included in Table 6-1. Vehicle noise events will be significantly noisier than normal speech and therefore the latter can be disregarded. It is understood that the commercial car park will not be used during night-time period therefore maximum noise levels at the commercial car park are not assessed.

Table 6-1 Typical Vehicle-related Noise Events

Noise Source	Typical Maximum Sound Power Level Lw – dB(A)
Car Accelerating	93 – 98
Car Starting	91 – 97
Car Door Closing	88 – 93
Car Moving	83 – 90

Note 1: The upper end of the sound power levels range have been used to predict car.

The upper end of the range of the sound power levels presented in Table 6-1 have been used to predict the noise impacts at surrounding residences. The following conservative worst case assumptions have been made in predicting noise impacts from the commercial car park.

- Duration of 30 seconds for 1 car acceleration event. A total of 3 car acceleration events have been assumed to occur in 1 hour.
- Duration of 60 seconds for 1 car starting event. A total of 3 car starting events have been assumed to occur in 1 hour.
- Duration of 2 seconds for 1 car door closing event. A total of 2 car door closing events have been assumed to occur in 1 hour.
- Duration of 30 seconds for 1 car moving event. A total of 2 car moving events have been assumed to occur in 1 hour.
- All the above events will occur simultaneously and the cumulative noise levels of all 8 events have been predicted.
- No boundary fence have been considered in the predicted levels.
- The loading bays in the car park are only used for small trucks and vans, noise impacts from these loading bays have been modelled as car type noise sources.

The predicted cumulative $L_{Aeq(15minute)}$ noise level from the outdoor commercial car park are as follow:

- 64 dB(A) $L_{Aeq(15minute)}$ at 3 Addlestone Road (adjoining residences to the south of the site); and
- 56 dB(A) $L_{Aeq(15minute)}$ at 6 Addlestone Road (nearest residences to the east of the site).

Both of these predicted noise levels are found to be in excess of the relevant noise criteria as stipulated in Section 4.2.

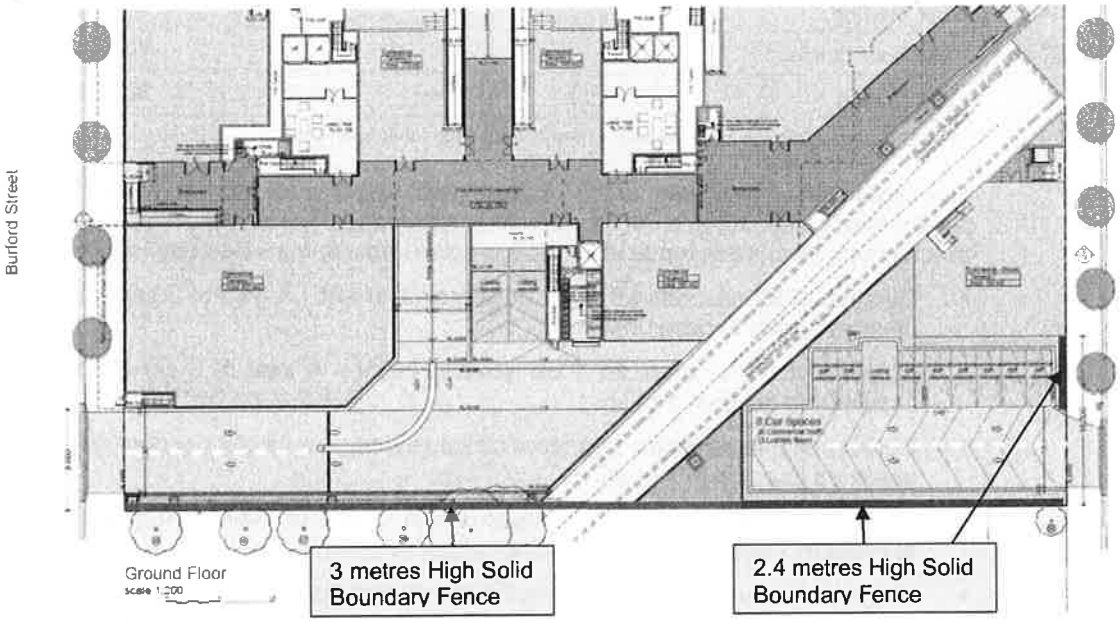
6.4 Noise Control Recommendations

Based on the above predicted loading dock and outdoor commercial car park noise levels at surrounding residences the following noise control recommendations have been provided:

- Restrict the use of the loading docks to daytime period of between 7:00 am and 6:00 pm. It is recommended that the loading docks be closed off with the use of physical barriers during evening and night-time periods, between 6:00 pm and 7:00 am.
- Restrict the use of the outdoor commercial car park to daytime and evening periods of between 7:00 am and 10:00 pm. It is recommended that the outdoor commercial car park be closed off with physical barriers during night-time period, between 10:00 pm and 7:00 am.
- Construct minimum 3 metres high solid boundary fence along the southern boundary as indicated in Figure 6-1 to attenuate noise from the loading bays.
- Construct minimum 2.4 metres high solid boundary fence along the southern and eastern boundaries as indicated in Figure 6-1 to attenuate noise from the outdoor commercial car park.

- The fences would need to be constructed of a solid panel, weighing not less than 10 kg/m^2 and with no gaps. Materials such as a "Colorbond" steel fence, lapped and capped timber, glass, perspex or a combination thereof would be suitable. Gaps should be fully sealed to create a solid barrier. This includes gaps at the base of the fences.

Figure 6-1 Recommended Boundary Fences



7 ADDITONAL ROAD TRAFFIC NOISE ASSESSMENT

Based on the "*Traffic Impact Assessment, Proposed Mixed Use Development, 272-276 & 280-284 Merrylands Road & 1 Addlestone Road, Merrylands*" report, prepared by Thompson Stanbury Associates, traffic volumes on Merrylands Road are projected to increase by up to 10% and on surrounding local roads are projected to increase by up to 20%.

The projected increases in traffic volume would increase the road traffic noise at existing residences on Merrylands Road by not more than 0.8 dB(A) and existing residences along surrounding local roads by not more than 1.5 dB(A).

These increases of less than 2 dB(A), according to the RNP, represents a minor impact that is considered barely perceptible to the average person. Therefore, road traffic noise impacts from additional traffic on existing surrounding roads generated by the proposed development are considered to satisfy the RNP criteria established in Section 4.4.

8 CONCLUSION

Rodney Stevens Acoustics has been engaged by NR Complex Pty Ltd to perform a road traffic noise assessment of the proposed residential development at the corner of Merrylands Road, Addlestone Road & Burford Street, Merrylands as part of the DA submission.

This assessment references:

- Holroyd Development Control Plans 2013 Part B – Residential Controls;
- NSW DoPI's State Environmental Planning Policy (Infrastructure);
- NSW EPA Industrial Noise Policy; and
- NSW EPA Road Noise Policy.

Noise assessment comprising the following impacts have been conducted:

- existing road traffic noise impacts on the residential component of the proposed development.
- proposed loading dock and outdoor commercial car park noise impacts on surrounding residences.
- road traffic noise impacts from additional traffic generated by the development on surrounding existing residences.

Noise control recommendations have been provided in this report to attenuate existing road traffic noise on the proposed development, as well as to attenuate loading dock and outdoor commercial car park noise impacts on surrounding residences.

Additional road traffic noise impact generated by the development has been assessed to comply with the RNP. Therefore, no control measures are required to attenuate noise from additional traffic on surrounding roads.

9 CLOSURE

This report has been prepared by Rodney Stevens Acoustics Pty Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of NR Complex Pty Ltd. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Rodney Stevens Acoustics.

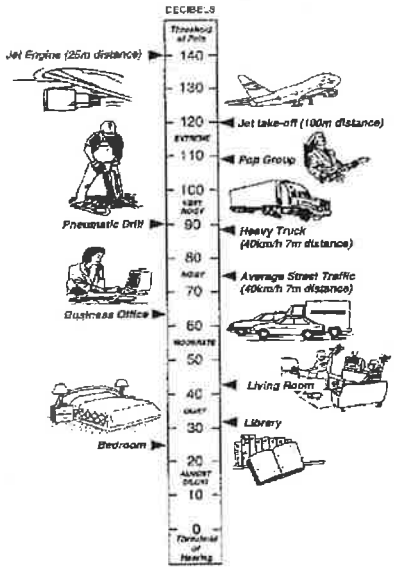
Rodney Stevens Acoustics disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Approved:-

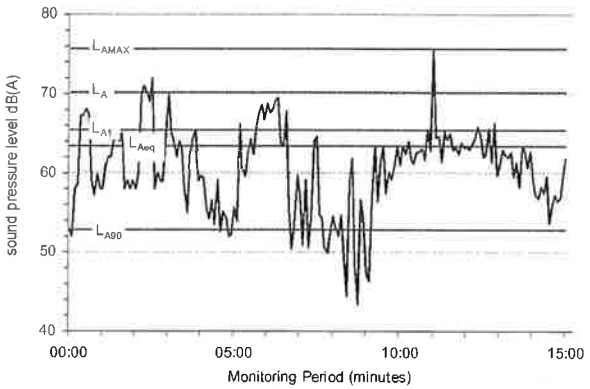
Rodney Stevens - MAAS

Appendix A – Acoustic Terminology

A-weighted sound pressure	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).
Ambient noise	The **total** noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	**Includes** noise annoyance due to: ▪ character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) ▪ character of the environment (e.g. very quiet suburban, suburban, urban, near industry) ▪ miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) ▪ human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	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.
Feasible and reasonable measures	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: ▪ Noise mitigation benefits (amount of noise reduction provided, number of people protected). ▪ Cost of mitigation (cost of mitigation versus benefit provided). ▪ Community views (aesthetic impacts and community wishes). ▪ Noise levels for affected land uses (existing and future levels, and changes in noise levels).
Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.
Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.

Noise criteria	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).
Noise level (goal)	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.
Noise limits	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.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	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.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	**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 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.  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 *dB(A)*.

Sound Pressure Level (SPL)	The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *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:



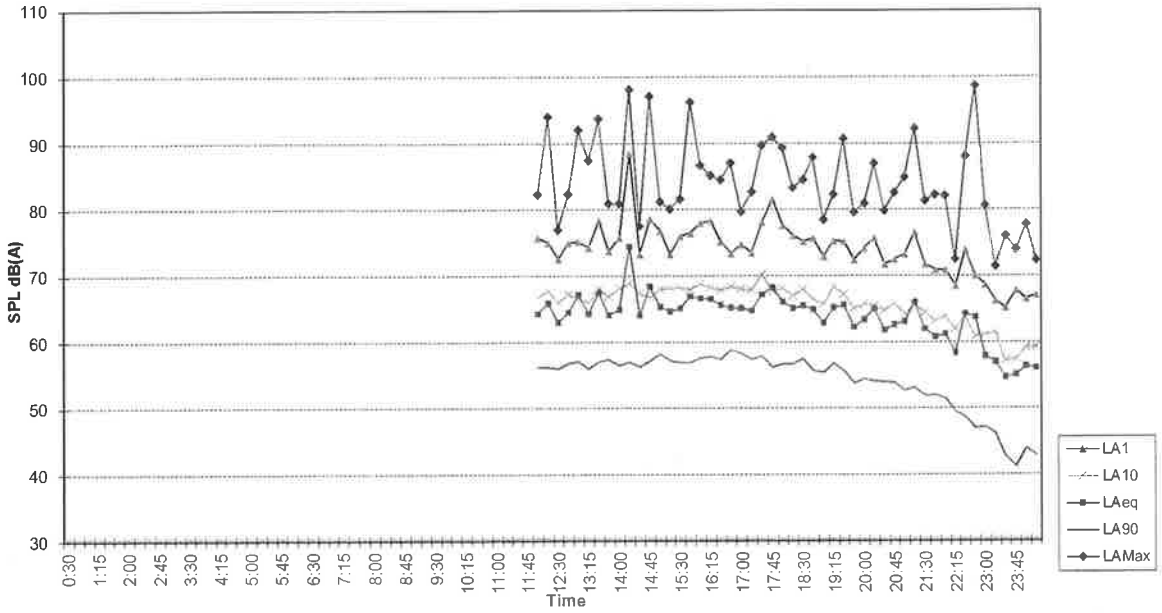
Key descriptors:

L_{Amax}	Maximum recorded noise level.
L_{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 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).

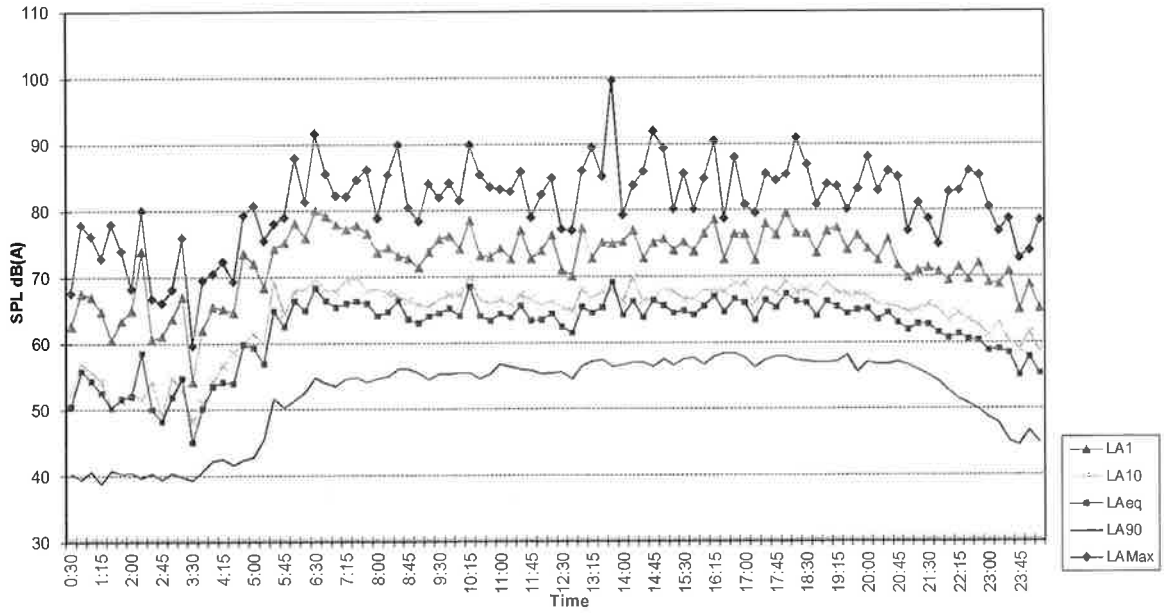
Threshold	The lowest sound pressure level that produces a detectable response (in an instrument/person).
Tonality	Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

Appendix B – Baseline Noise Survey Graphs

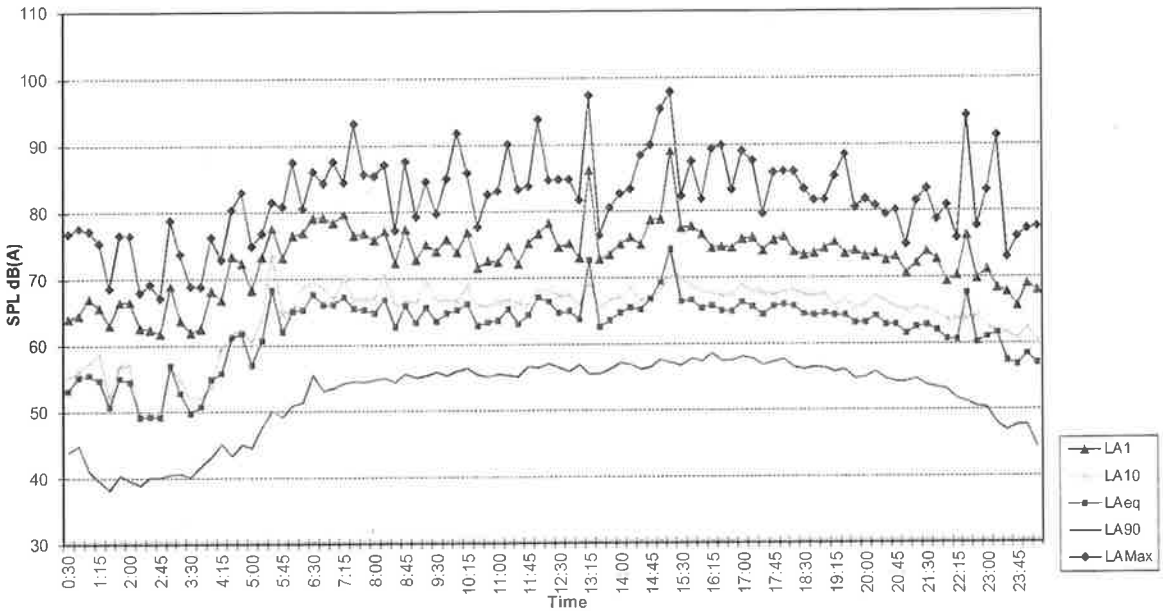
Location - Northern boundary of project site, approximately 7 metres from the kerb of Merrylands Road
Measured Noise Levels - Wednesday 10/07/2013



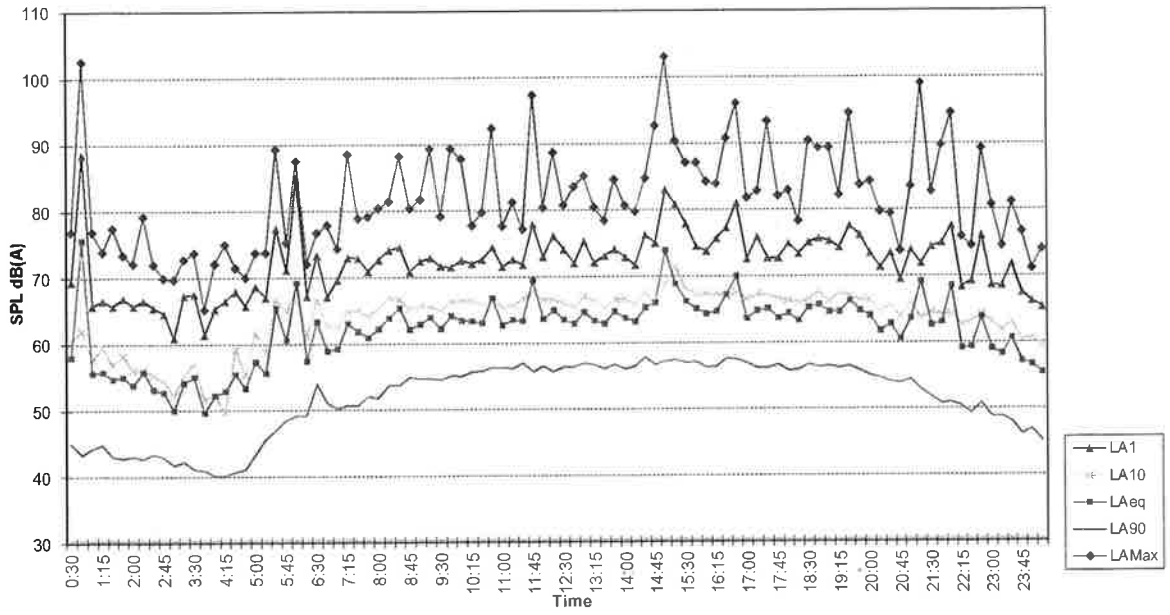
Location - Northern boundary of project site, approximately 7 metres from the kerb of Merrylands Road
Measured Noise Levels - Thursday 11/07/2013



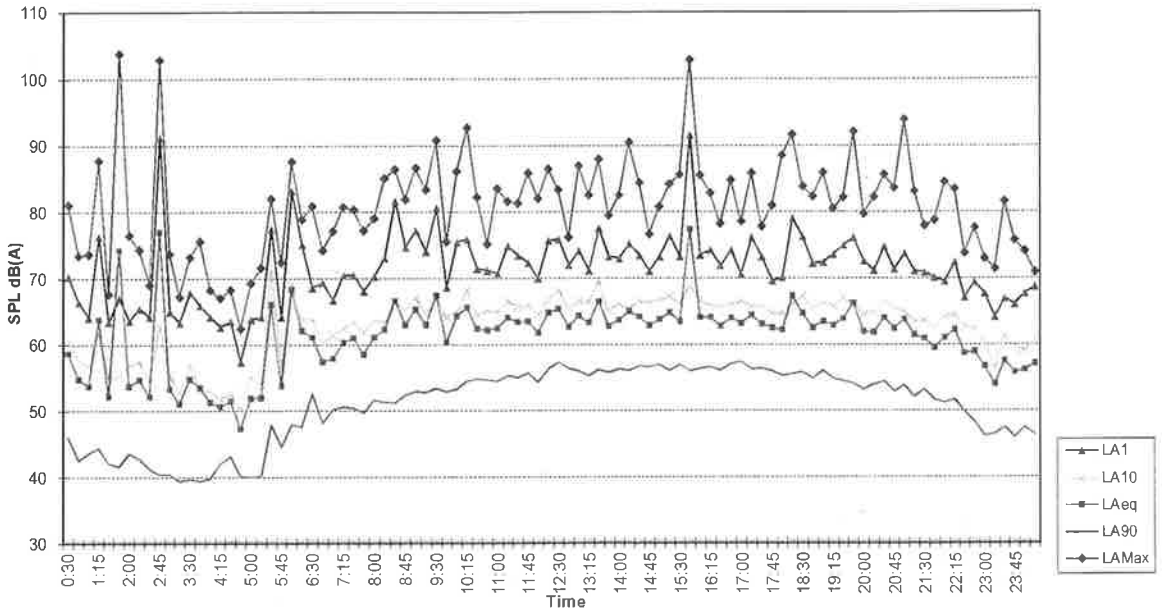
Location - Northern boundary of project site, approximately 7 metres from the kerb of Merrylands Road
Measured Noise Levels - Friday 12/07/2013



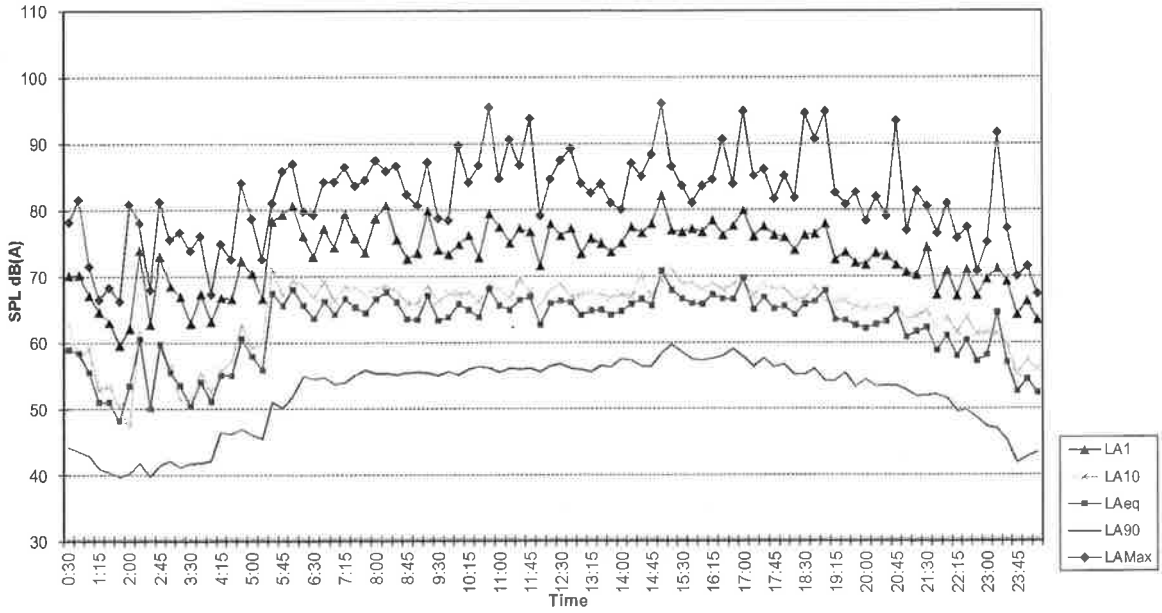
Location - Northern boundary of project site, approximately 7 metres from the kerb of Merrylands Road
Measured Noise Levels - Saturday 13/07/2013



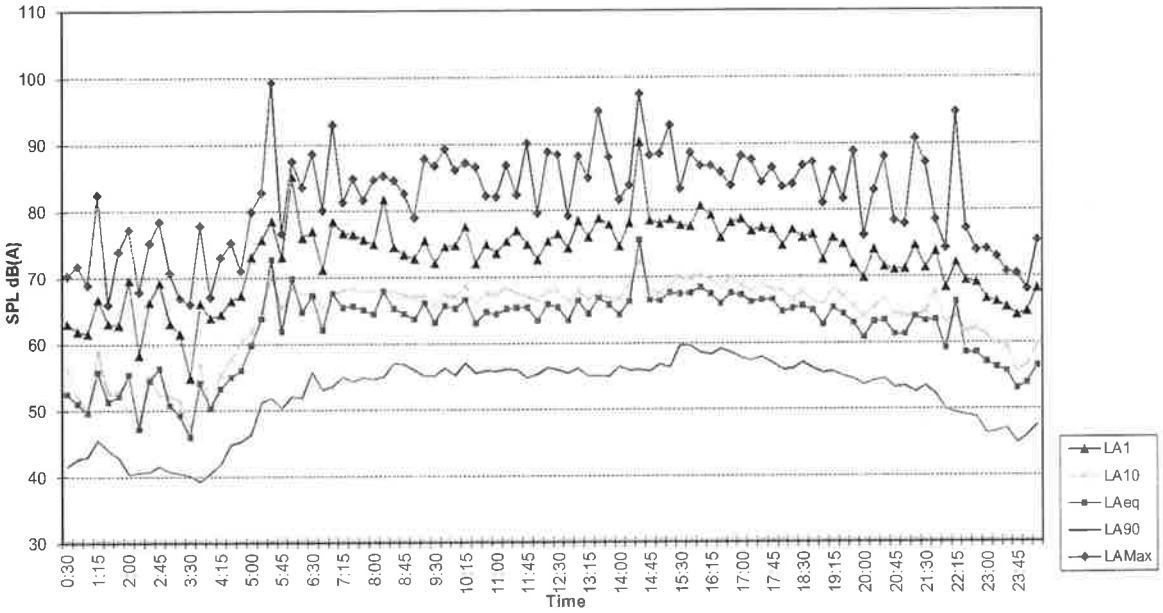
Location - Northern boundary of project site, approximately 7 metres from the kerb of Merrylands Road
Measured Noise Levels - Sunday 14/07/2013



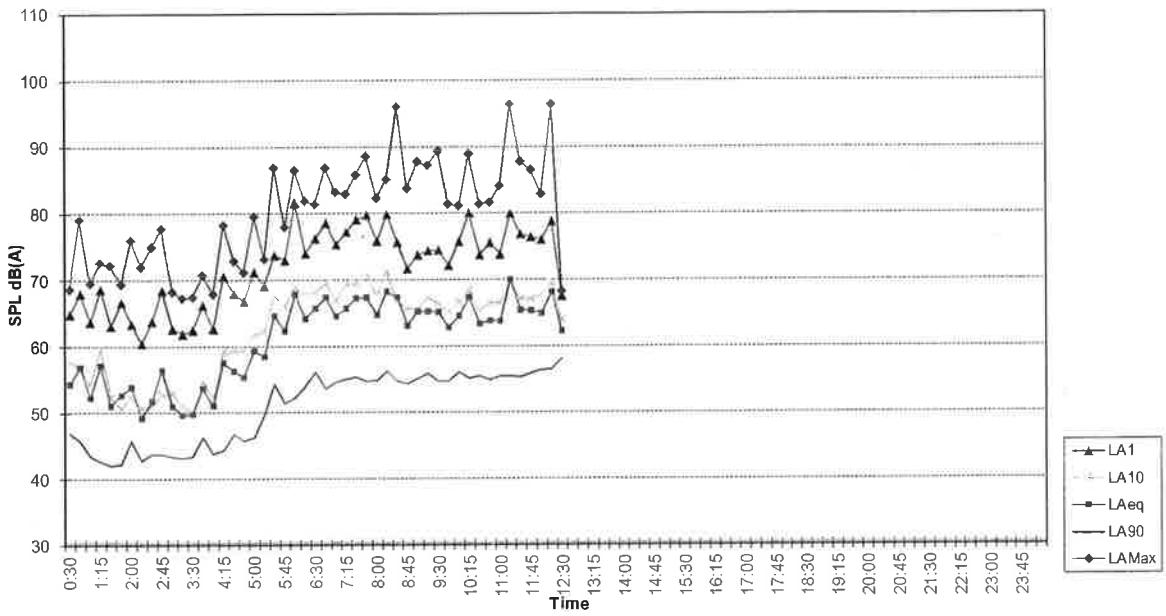
Location - Northern boundary of project site, approximately 7 metres from the kerb of Merrylands Road
Measured Noise Levels - Monday 15/07/2013



Location - Northern boundary of project site, approximately 7 metres from the kerb of Merrylands Road
Measured Noise Levels - Tuesday 16/07/2013



Location - Northern boundary of project site, approximately 7 metres from the kerb of Merrylands Road
Measured Noise Levels - Wednesday 17/07/2013



Appendix C – Calibration Certificate

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Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Calibration Certificate

Number : C13301

Client Details :	Rodney Stevens Acoustics Pty Ltd
	1 Majura Close
	St Ives Chase NSW 2075
Equipment Tested/ Model Number :	**Rion NL-42**
Instrument Serial Number :	00133010
Microphone Serial Number :	144589
Preamplifier Serial Number :	23057
Ambient Temperature :	23°C
Relative Humidity :	49%
Barometric Pressure :	101.7 kPa
Calibration Technician :	Adrian Walker
Calibration Date :	07-June-2013
Secondary Check by :	Luke Hudson
Report Issue Date :	11-June-2013
Approved Signatory :	
Tested To :	AS1259.1 1990
	AS1259.2 1990
Comments :	All tests passed for type 2

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	Pass	10.4.3: Time weighting characteristic I	Pass
10.2.3: Frequency weighting	Pass	10.4.5: R.M.S performance	Pass
10.3.2: Overload indications	Pass	9.3.2: Time averaging	Pass
8.9: Detector-indicator linearity	Pass		
8.10: Differential level linearity	Pass		
10.3.4: Inherent weighted system noise level	Pass		
10.4.2: Time weighting characteristics F and S	Pass		

NATA
ACCREDITATION

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Accredited for compliance with ISO/IEC 17025
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CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: **SLM 39456 &FILT 0002**

Equipment Description:	Sound Level Meter		
Manufacturer:	Svantek		
Model No:	Svan-971	**Serial No:**	28280
Microphone Type:	7052E	**Serial No:**	53931
Filter Type:	1/3 Octave	**Serial No:**	28280
Comments:	All tests passed for type 1. (See over for details)		
Owner:	Rodney Stevens Acoustisc 1 Majura Close St Ives Chase, NSW 2075		
Ambient Pressure:	1000 hPa ±1.5 hPa		
Temperature:	23 °C ±2° C	**Relative Humidity:**	53% ±5%
Date of Calibration:	04/02/2013	**Issue Date:**	04/02/2013
Acu-Vib Test Procedure:	AVP05 (SLM) & AVP06 (Filters)		

CHECKED BY: AUTHORISED SIGNATORY: .....

Accredited for compliance with ISO/IEC 17025
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/international standards

NATA
Accredited Lab. No. 9262
Acoustic and Vibration Measurements

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