RODNEY STEVENS ACOUSTICS
Acoustic Consultants
Member Australian Acoustical Society

REPORT 170518R2

Revision 1

S96 Noise Impact Assessment
Proposed Restaurant & Café Precinct Expansion
78-88 Tench Avenue, Jamisontown

PREPARED FOR:
Morson Group

25 September 2018

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S96 Operational Noise Impact Assessment

Proposed Restaurant & Café Precinct Expansion

78-88 Tench Avenue, Jamisontown

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (RSA) has been engaged by Morson Group to conduct an operational noise impact assessment for the proposed restaurant & café precinct expansion located at 78-88 Tench Avenue, Jamisontown, NSW. It is understood that the S96 application is to modify the previously approved trading hours to Monday to Sunday 7:00 am to 1:00 am.

This assessment addresses the potential operational noise impacts associated with the proposed restaurant & café precinct (Precinct) expansion on the amenity of neighbouring residences.

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

- Patron noise from the expanded Precinct on the amenity of neighbouring residences;
- Car park noise from the expanded Precinct on the amenity of neighbouring residences
- Proposed external mechanical services plant on the amenity of neighbouring residences;

This assessment report will form part of the S96 Application submission to Penrith City Council.

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

2 PROPOSED PROJECT

2.1 Project Site

The proposed project site is bounded by Tench Avenue and an existing public car park to the north-west and greenfield sites to the north-east, south-east and south-west. The nearest residences are located north-east and south-west of the project site along Tench Avenue and Cross Road, at distances of approximately 220 metres and 250 metres (m) respectively.

The existing environment surrounding at the project site is mainly influenced by road traffic noise from the M4 Western Motorway and Tench Avenue. Figure 2-1 shows an aerial image of the project site and the surrounding environment.

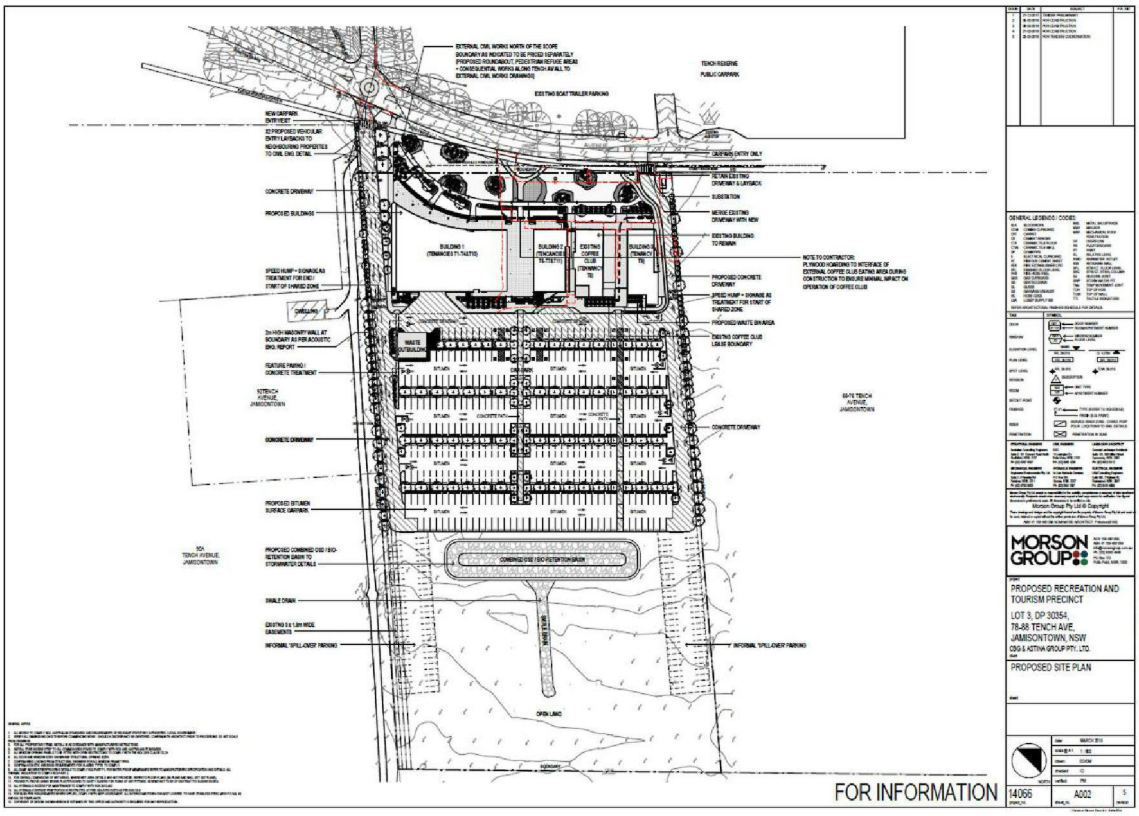
2.2 Project Description

The project is to operate an expanded restaurant & café precinct at the existing restaurant premises at 78-88 Tench Avenue, Jamisontown. It is understood that the Precinct will be operating between 7:00 am and 1:00 am from Monday to Sunday. Figure 2-2 below are the site plan of the proposed precinct.

Figure 2-1 Site Location

Image Courtesy of Near Map © 2018.

Figure 2-2 Project Site Plan



3 BASELINE NOISE SURVEY

3.1 Unattended Noise Monitoring

In order to characterise the existing noise environment of the area, unattended noise monitoring was conducted between the dates of 5 July 2018 and 13 July 2018 at the logging location shown in Figure 2-1. The noise logger set up at the project site is representative of the existing noise environment surrounding the project site and the nearest residences.

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 other landowners.

Instrumentation for the survey comprised of a RION NL-42 environmental noise logger (serial number: 546395) 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 have 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 to Assess Noise Emission

In order to assess noise emission from the proposed operations of the project site, the data obtained from the loggers have been processed in accordance with the procedures contained in the EPA's *Industrial Noise Policy* (NPFI) to establish representative noise levels that can be expected at the nearest residences and the immediate industrial area. The results of this analysis are presented in Table 3-1 below.

Table 3-1 Measured Ambient Noise Levels Corresponding to Defined NPfI Periods

Logger 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
78-88 Tench Avenue Jamisontown	L_{Aeq}	63	53	52
	RBL (Background)	46	46	40

4 OPERATIONAL NOISE CRITERIA

This section presents noise criteria relating to noise emission which are applicable to the proposed change of usage.

4.1 Noise Policy for Industry

The EPA oversees the NPfI which provides a framework and process for deriving noise criteria. The NPfI criteria for industrial noise sources (e.g. 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.

4.1.1 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. The assessment of intrusiveness only applies to residential receivers.

4.1.2 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

4.1.3 Area Classification

The NPFI classifies the noise environment of the subject area as “Urban”.

The NPfI 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.

4.1.4 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 NPfI 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 ANL and intrusive criteria.

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

Receiver Type	Time of Day	Noise Level dB(A) re 20 µPa				
		ANL (period)	Measured RBL[2] $L_{A90,15minute}$	Measured $L_{Aeq,15minute}$	NPFI Criteria	
					Intrusive	Amenity
					$L_{Aeq,15minute}$ Criterion for New Sources	$L_{Aeq,Period}$ Criterion for New Sources[3]
Residence	Day	60	46	63	**51**	60
	Evening	50	46	53	51	**50**
	Night	45	40	52	45	**45**
	Shoulder Period (12-1am)	45	40	52	**45**	45

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

In summary, the project specific noise emission criteria established by the NPfI for this site are:

- At Surrounding Residences on Cross Road and Tench Avenue –
  - Day 51 dB(A)
  - Evening 50 dB(A)
  - Night 45 dB(A)

4.2 Sleep Disturbance Criteria

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Noise Policy for Industry provides the following guidelines on the project trigger noise levels:

Where the subject development/premises night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,

For planning purposes the assumed level of background noise for the night-time period is taken to be the night-time Rating Background Level, as given in **Error! Reference source not found.** resulting in a sleep disturbance criterion of:

- $L_{Aeq(15min)}$ 45 dBA (NPfI requirement, RBL+5)
- L_{AFmax} 55 dBA (NPfI requirement, RBL+15)

5 ROAD NOISE POLICY CRITERIA

It is predicted by Thomson Stanbury Associates Pty Ltd (Project Traffic Consultant) that road traffic on Tench Avenue will potentially increase due to the proposed development. Therefore, assessment of road traffic noise impact on existing residences due to additional traffic on Tench Avenue will be required.

The EPA Road Noise Policy (RNP, 2011) provides the accepted criteria for limits on operational road noise (see Table 5-1). 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 recognizes "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 5-1 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)	-	-

Other non-residential sensitive receivers in the vicinity of the proposed development have been identified to the Tench Reserve. The RNP criterion for open space for passive use has been presented in Table 5-2 below.

Table 5-2 RNP Noise Assessment Criteria for Non-Residential Land Use

Existing Sensitive Land Use	Assessment Criteria – dB(A)	
	Day (7 am – 10 pm)	Night (10 pm – 7 am)
Open Space (passive use)	$L_{Aeq,\ (15hour)}$ 55 (external) when in use	

6 OPERATIONAL NOISE IMPACT ASSESSMENT

6.1 Patron & Background Noise Assessment

6.1.1 Typical Patron Vocal Levels

The following sections summarise the results of patron noise assessment and predicted levels at surrounding residential receivers as a result of the proposed operation of the outdoor seating areas (see Figure 2-2).

Calculations of the amount of noise transmitted to these receivers from the proposed outdoor seating area have been made based on a typical patron sound power spectrum as based on a Harris loud voice. The sound power levels are derived from Table 16.1 in "*Handbook of Acoustical Measurements and Noise Control*" by C.M. Harris. Harris indicates that a typical casual male voice is 53 dB(A) at 1 m, a typical normal voice is 58 dB(A) at 1 m, a typical raised voice is 65 dB(A) at 1 m, a typical loud voice is 75 dB(A) at 1 m and a shouting voice is 88 dB(A) at 1 m. Taking the standard conversion of adding 8 dB(A) to convert sound pressure level at 1 m to sound power level, the sound power level of a typical normal voice equates to 66 dB(A).

The sound power spectrum a patron talking with a vocal effort of normal voice is shown in Table 6-1 below:

Table 6-1 Typical Sound Power Level of 1 Person with Normal Voice - $L_{w\ -\ dB(A)}$

Scenario	Resultant Noise Level per Octave Band (dB)								Overall - dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
1 Patron – Normal Vocal	46	49	55	58	51	47	43	37	58

This spectrum and overall noise level is believed to be a reasonable approximation of the typical "worst case" that could be expected from the operation of the proposed outdoor seating area.

6.1.2 Patron Sound Power Levels

Based on a maximum number of 408 patrons in the outdoor seating areas and a maximum of 516 patrons in the internal seating areas, the following worst-case operational scenarios have also been assumed for our assessment:

- With 50 percent of the patrons talking at any one time, the worst case scenario will be 204 patrons talking in the outdoor seating areas at any one time.
- With 50 percent of the patrons talking at any one time, the worst case scenario will be 258 patrons talking in the internal seating areas at any one time.

Table 6-2 Sound Power Levels of People talking with Normal Voice - L_w – dB(A)

Scenario	Resultant Sound Power Level per Octave Band (dB)								Overall – dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
204 Patrons in Outdoor Seating Areas – Normal Vocal	69	70	80	87	85	79	75	66	89
258 Patrons in Internal Seating Areas – Normal Vocal	70	71	81	88	86	80	76	67	90

The 32 Hz octave band has not been assessed due to the limited availability of transmission loss (TL) data in this low (bass) frequency band. It is also very likely that even if noise emission in this low frequency octave band exceeds the noise criterion; it will be very close to, if not below, the human threshold of hearing at the receivers.

Appropriate source sound power levels have been made for the varying distribution number of patrons.

6.1.3 Background Music Sound Power Level

Based on a typical background music in a restaurant/pub, the sound power level spectrum of typical background music is shown in Table 6-3 below:

Table 6-3 Typical Sound Power Level of Typical Pub Background Music - L_w – dB(A)

Scenario	Resultant Sound Power Level per Octave Band (dB)								Overall – dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Typical Pub Background Music	84	89	84	84	82	75	67	63	86

The 32 Hz octave band has not been assessed due to the limited availability of transmission loss (TL) data in this low (bass) frequency band. It is also very likely that even if noise emission in this low frequency octave band exceeds the noise criterion; it will be very close to, if not below, the human threshold of hearing at the receivers.

6.1.4 Patron and Background Music Noise Impacts

Predictive resultant noise spectrums have been calculated for patron and background music noise emission at nearest residential receivers are presented in Table 6-4. The following assumptions have been made in the noise modelling of the outdoor play area noise impacts on nearby residents:

- Source height of patrons are taken to be 1.5 metres above ground;
- Source height of background music are taken to be 2 metres above ground;
- Receiver heights for residents are taken to be 1.5 metres above ground;
- Predicted noise levels have made from the centre of the project site to within 1 metre of the nearest residential boundaries;
- Distance from the centre of the site to the nearest Tench Avenue residential boundary is approximately 130 metres;
- Distance from the centre of the site to the nearest residential boundary to the west of the site is approximately 290 metres;

Table 6-4 Patron and Background Music Noise Assessment at Nearby Noise Sensitive Receivers

Noise Source	Predicted Operational Noise Impact at Nearest Residents – dB(A)	
	Nearest Tench Avenue Residents at 130 metres from Centre of the Site	Nearest Residents Across M4 Motorway at 290 metres from Centre of the Site
Outdoor Seating Patron Talking	41	34
Internal Seating Patron Talking	31	25
Background Music	38	31
Total Noise Level	**43**	**36**

The combined patron and background music noise impacts from the operation of the proposed restaurant and café precinct have been predicted to comply with the night time period noise goals at the nearest residents.

6.2 Car Park Operations Noise Impacts

Acoustic modelling of the car park noise emissions was carried out using the methodology of Bayerisches Landesamt für Umwelt's report *Parking Area Noise*. The *Parking Area Noise* prediction methodology utilises an L_{Aeq} based source sound power level that is representative of one complete vehicle movement in one hour for normal parking motions (i.e. entering the car park, searching for a car parking space, open and closing car doors, re-starting the engine and exiting the car park). Hence the major variables accounted for in this methodology include the number of vehicle movements, the location of the car park relative to noise sensitive receivers and the surface finish (e.g. sealed asphalt, unsealed gravel etc.).

The following most appropriate assumptions from the *Parking Area Noise* methodology have been used to predict car park noise impacts at nearest residences:

- Total car parking spaces – 232 (61 existing and 171 proposed);
- L_{w0} – 65 (As no restaurant parking area type provided, L_{w0} for "*Parking area near a purchase market*" has been used. Refer to Table 30 of Section 7.1.5 of *Parking Area Noise*);
- K_{PA} – 3 (Parking area type for "*Restaurants*" used. Refer to Table 34 of Section 8.1 of *Parking Area Noise*);
- K_I – 4 (Parking area type for "*Restaurants*" used. Refer to Table 34 of Section 8.1 of *Parking Area Noise*);
- K_{Stro} – 0 (for asphalt driving lanes used. Refer to Section 8.2.1 of *Parking Area Noise*);
- N_{day} – 0.12 (Parking area type for "*Restaurants in rural district*" used. Refer to Table 33 of Section 8.1 of *Parking Area Noise*);
- N_{night} – 0.03 (Parking area type for "*Restaurants in rural district*" used. Refer to Table 33 of Section 8.1 of *Parking Area Noise*);

6.2.1 Predicted Car Park Operational Noise

Predicted noise levels from the operation of the car park are presented in Table 6-5 below.

Table 6-5 Predicted Noise Levels at Nearest Sensitive Receivers

Receiver	Receiver Type	Period	Predicted Noise Level – dB(A)		NPFI Criteria – dB(A)		Exceedance – dB(A)	
			$L_{Aeq,\ 15\ minute}$	$L_{Aeq,\ Period}$	Intrusive $L_{Aeq,\ 15\ minute}$	Amenity $L_{Aeq,\ Period}$	Intrusive $L_{Aeq,\ 15\ minute}$	Amenity $L_{Aeq,\ Period}$
Nearest Tench Avenue Residents at 130 metres from Centre of the Site	Residential	Day	49	45	51	60	-	-
		Evening	-	-	51	50	-	-
		Night	43	39	45	45	-	-
Nearest Residents Across M4 Motorway at 290 metres from Centre of the Site	Residential	Day	42	38	51	60	-	-
		Evening	-	-	51	50	-	-
		Night	36	32	45	45	-	-

Note 1: Noise Levels for the evening period are not covered in the Parking Area Noise prediction methodology and are therefore not provided.

It is noted that the operational noise levels at the nearest residential receivers predicted using the *Parking Area Noise* methodology comply with the project noise goals as presented in Table 4-1 for normal parking motions. As the restaurant and café precinct car park noise levels are predicted to comply with the noise limits during the daytime and night-time periods, it can be assumed that the noise levels during the evening period are likely to achieve compliance.

6.3 Combined Operational Noise Impacts

Predicted combined operational noise levels of the proposed restaurant and café precinct at nearest residences are detailed in Table 6-6.

The predicted noise impacts are representative of peak worse case operational noise levels where maximum number of patrons talking, the background music is operating and the car park operation are occurring simultaneously. A reduction in predicted noise impacts would be expected where fewer patrons and lesser vehicle movement are occurring simultaneously.

Table 6-6 Predicted Combined Operational Noise Impacts at Receivers

Receiver	Period	Predicted $L_{Aeq,15min}$ noise impacts – dB(A)					Noise Criterion		Compliance
		Patron & Background Music	Car Park Vehicle Movement		Overall				
			Intrusive	Amenity	Intrusive	Amenity	Intrusive	Amenity	
Nearest Tench Avenue Residents, East of Project Site	Day	43	49	45	50	47	51	60	Yes
	Evening		49[1]	45[1]	50	47	51	50	Yes
	Night		43	39	46	45	45	45	Yes[2]
Nearest Residents West of Project Site, Across M4 Motorway	Day	36	42	38	43	40	51	60	Yes
	Evening		42[1]	38[1]	43	40	51	50	Yes
	Night		36	32	39	38	45	45	Yes

Note 1: Daytime intrusive and amenity car park noise levels have been used to assess the evening criteria.

Note 2: A minor 1 dB(A) exceedance has been predicted and considered to be acoustically insignificant. This is because a 1 dB change in noise level is not perceivable by the average human hearing. Hence, the predicted noise impact is considered to be achieve compliance.

6.4 Car Park Sleep Disturbance Noise Impact

Spreadsheet noise propagation calculations have been undertaken in order to predict the $L_{A1,60\ Seconds}$ noise levels from car park activities such as door closing, car accelerating, engine starts etc., at surrounding sensitive receivers. The $L_{A1,60\ Second}$ is comparable to the typical maximum noise level of a particular event. The $L_{A1,60\ second}$ noise levels are used to for assessment against the sleep disturbance screening levels discussed in Section 4.2.

Table 6-7 Typical Maximum Sound Power Level of Short-term Car Event

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

The predicted $L_{A1,60\ Second}$ noise levels from the nearest car parking space to the nearest residential façade are presented in Table 6-8.

Table 6-8 Predicted Maximum Noise Events from Car Park at Residential Receivers

Receiver	Noise Source	Maximum Noise Level $L_{A1,60second}$ – dB(A) [1]	Sleep Disturbance External Screening Assessment Level
Tench Avenue Residents to the East of the Project Site	Car Accelerating	40 to 48	55
	Car Starting	41 to 47	
	Car Door Closing	38 to 43	
	Car Moving	33 to 40	
Residents to the West of the Project Site, Across from M4 Motorway	Car Accelerating	33 to 41	55
	Car Starting	34 to 40	
	Car Door Closing	31 to 36	
	Car Moving	26 to 33	

The predicted $L_{A1,60\ second}$ noise levels comply with the 55 dB(A) sleep disturbance criteria during car accelerating, car starting and car door closing events at nearby residences.

Based on the predicted compliance of the maximum car park noise impacts, no additional noise control will be required.

7 NOISE CONTROL RECOMMENDATIONS

Based on the predicted operational noise impacts exceedances (refer Table 6-6) the following noise management and control measures are recommended to ensure that the precinct operates in compliant manner:

- An electronic frequency dependant limiting device should be installed to the sound system to ensure that the amplified background music is set to the limit the background music to the levels set out Table 7-1 below. Ensure that speakers are arranged to face into the precinct and should not be facing out towards any resident.

Table 7-1 Background Music Limiting Levels

Resultant L10 Noise Level at 1 metre per Octave Band (dB)								Overall L_{A10} dB(A)
63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
83	88	83	83	81	74	66	62	85

- All external doors to have self-closing mechanisms. All external doors to be full acoustic perimeter seals for night time operation.

- Signs should also be posted at exit doors reminding patrons to leave the premises in an orderly and quiet manner when leaving the premises

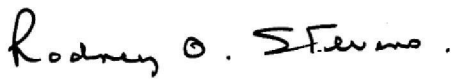
8 CONCLUSION

Rodney Stevens Acoustics Pty Ltd has conducted a S96 stage noise impact assessment of the proposed restaurant and café precinct at 78-88 Tench Avenue, Jamisontown.

This assessment has been carried out in accordance with NSW EPA *Noise Policy* for *Industry* and other relevant criteria this report is to form part of a S96 Application for the site to Penrith City Council. A noise impact assessment has been conducted in relation to the proposed restaurant and café precinct operations specifically noise impacts from the patrons talking, background music and car park vehicle movement.

Based on the above assessment of worst case scenario, RSA deems the project site to be suitable for operation, provided that the noise control measures recommended in Section 7 of this report are implemented.

Approved:-



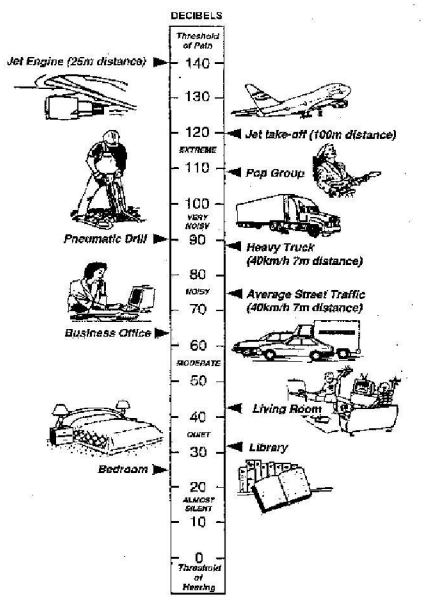
Rodney Stevens

Principal

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 10^{th} 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)*.

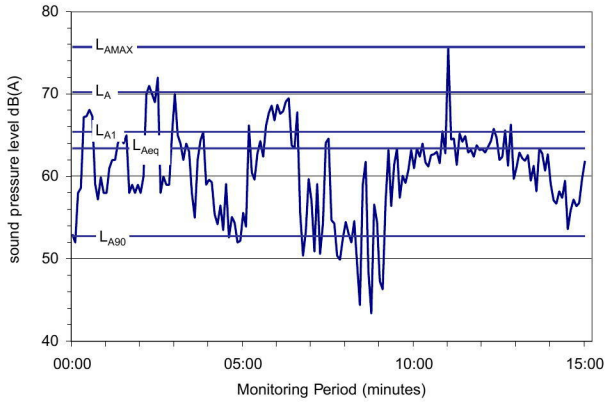
Sound Pressure Level (SPL)

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:



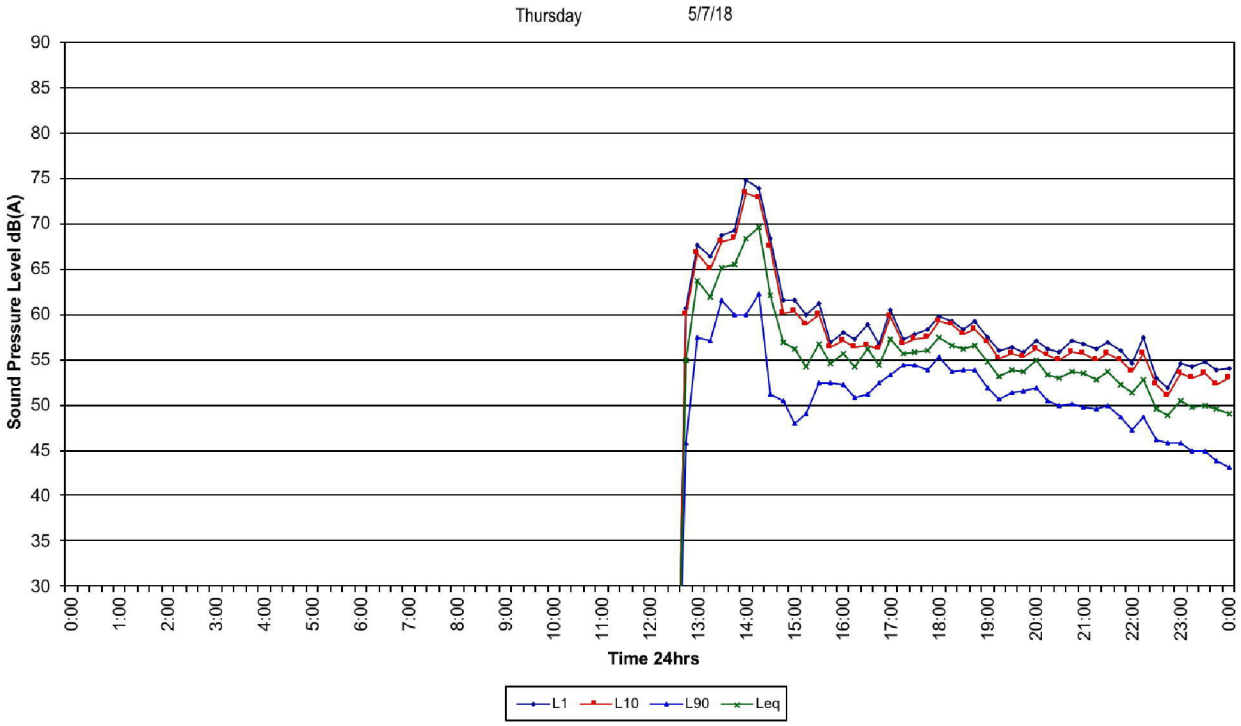
Key descriptors:

L_{Amax} Maximum recorded noise level.

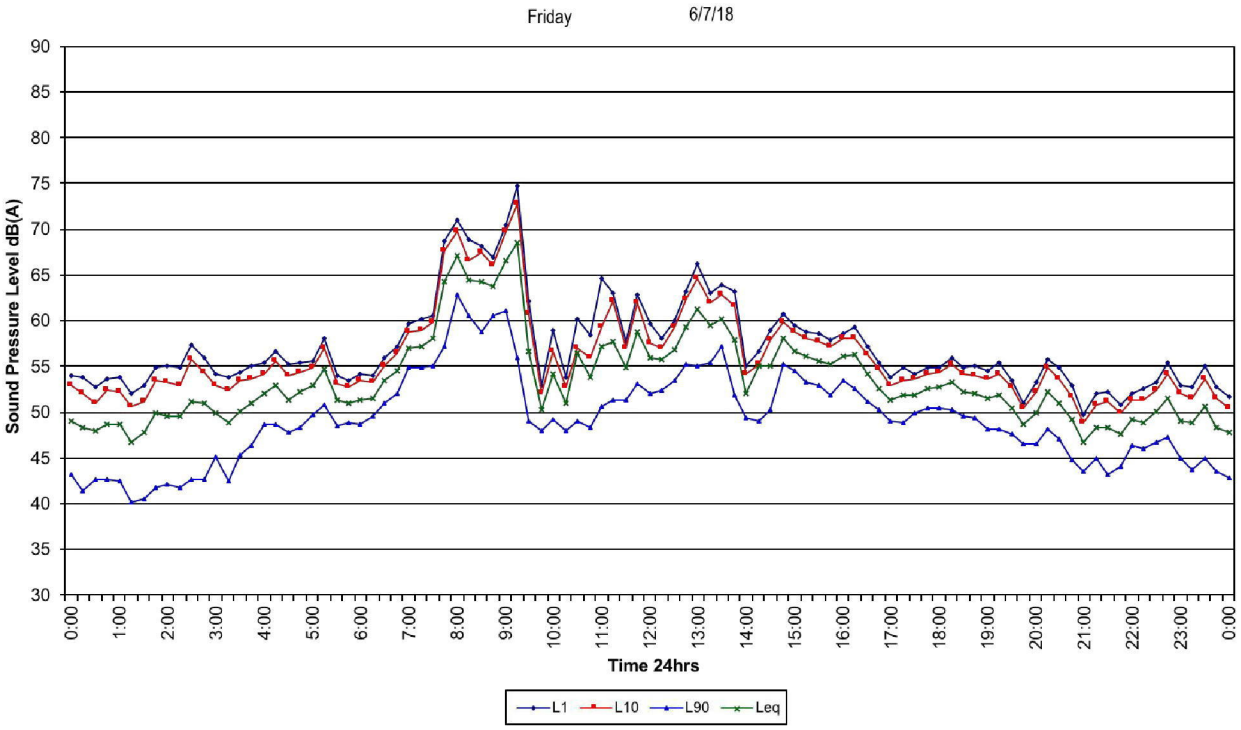
	L_{A1}	The noise level exceeded for 1% of the 15 minute interval.
	L_{A10}	Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level.
	L_{Aeq}	Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level 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

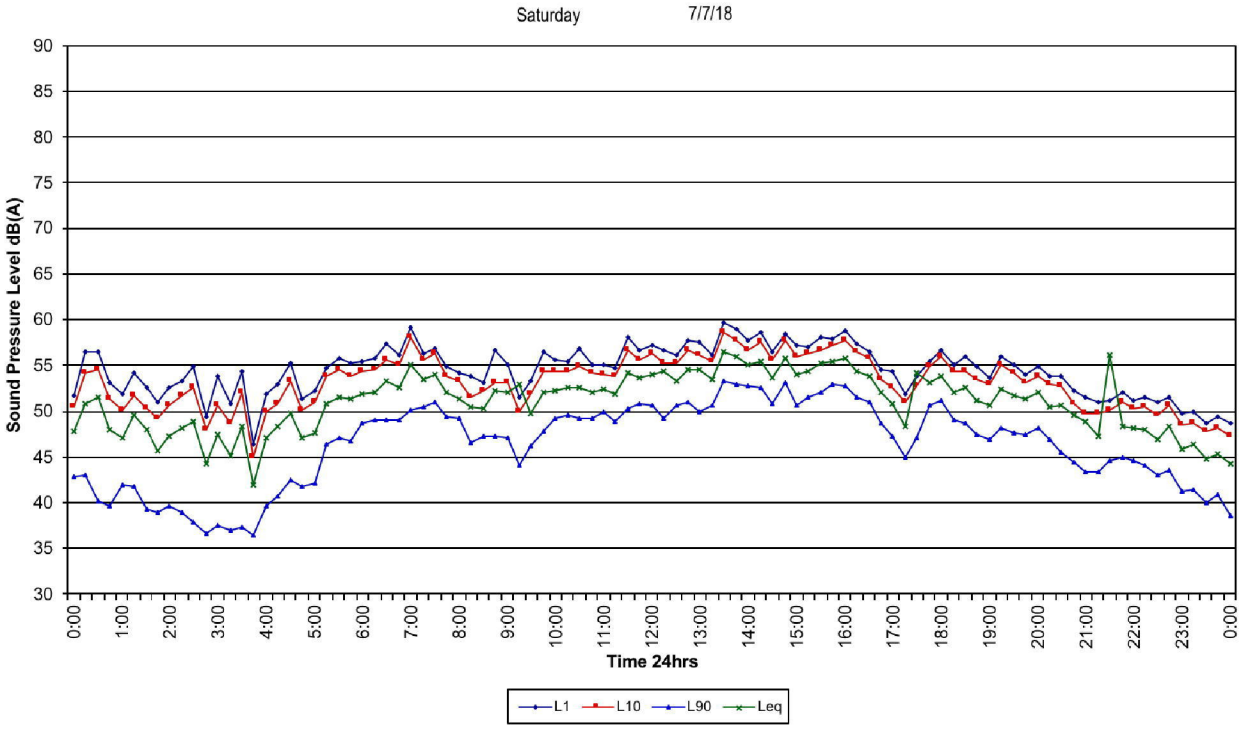
78 - 88 Tench Ave, Jamisontown



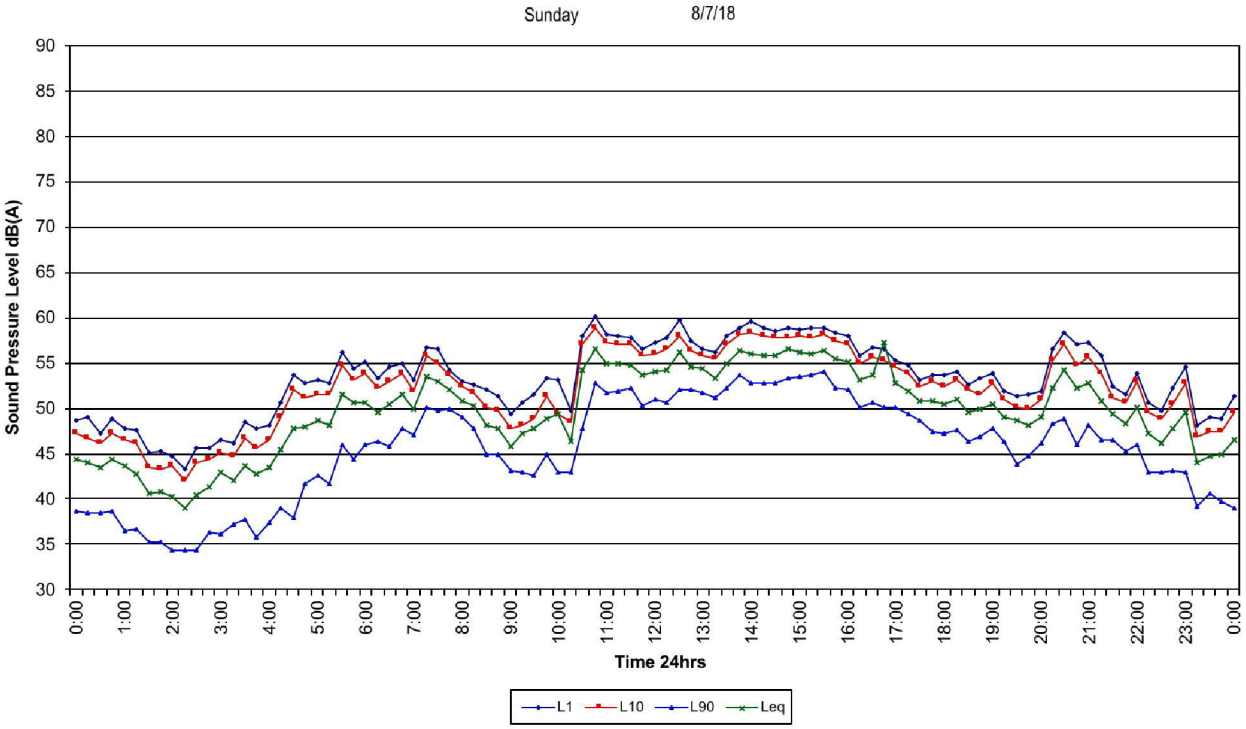
78 - 88 Tench Ave, Jamisontown



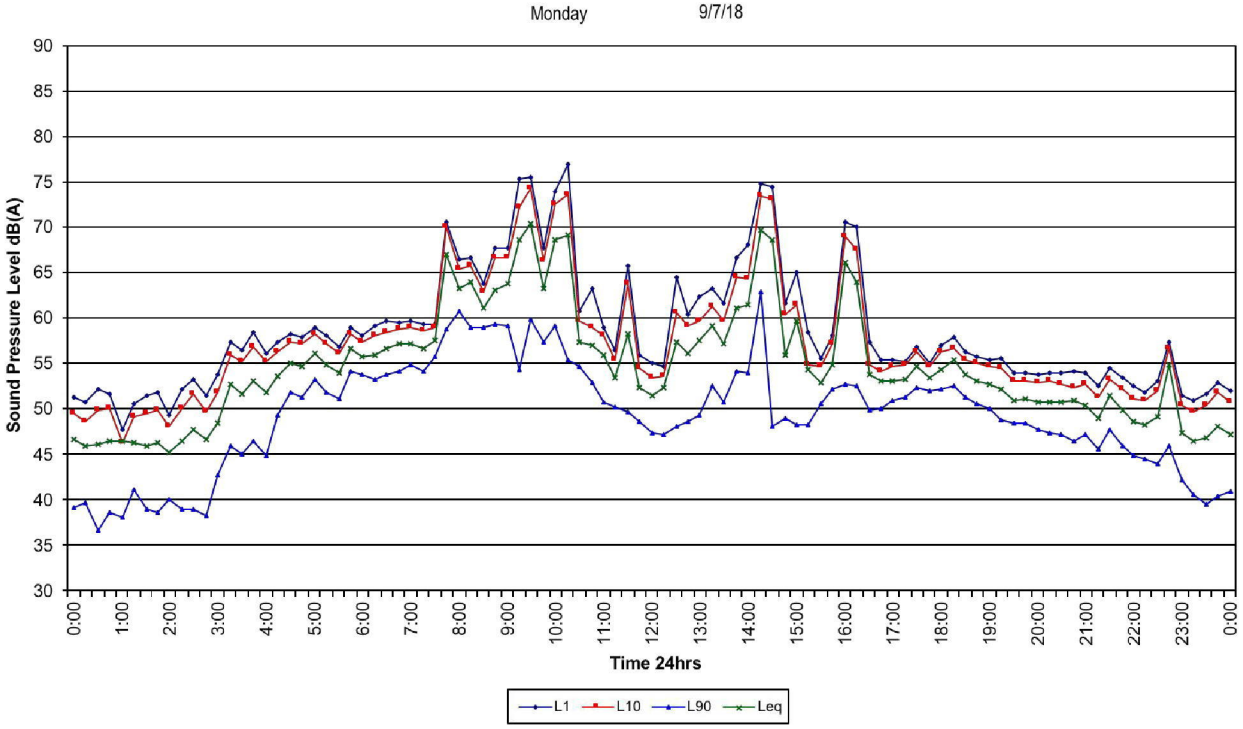
78 - 88 Tench Ave, Jamisontown



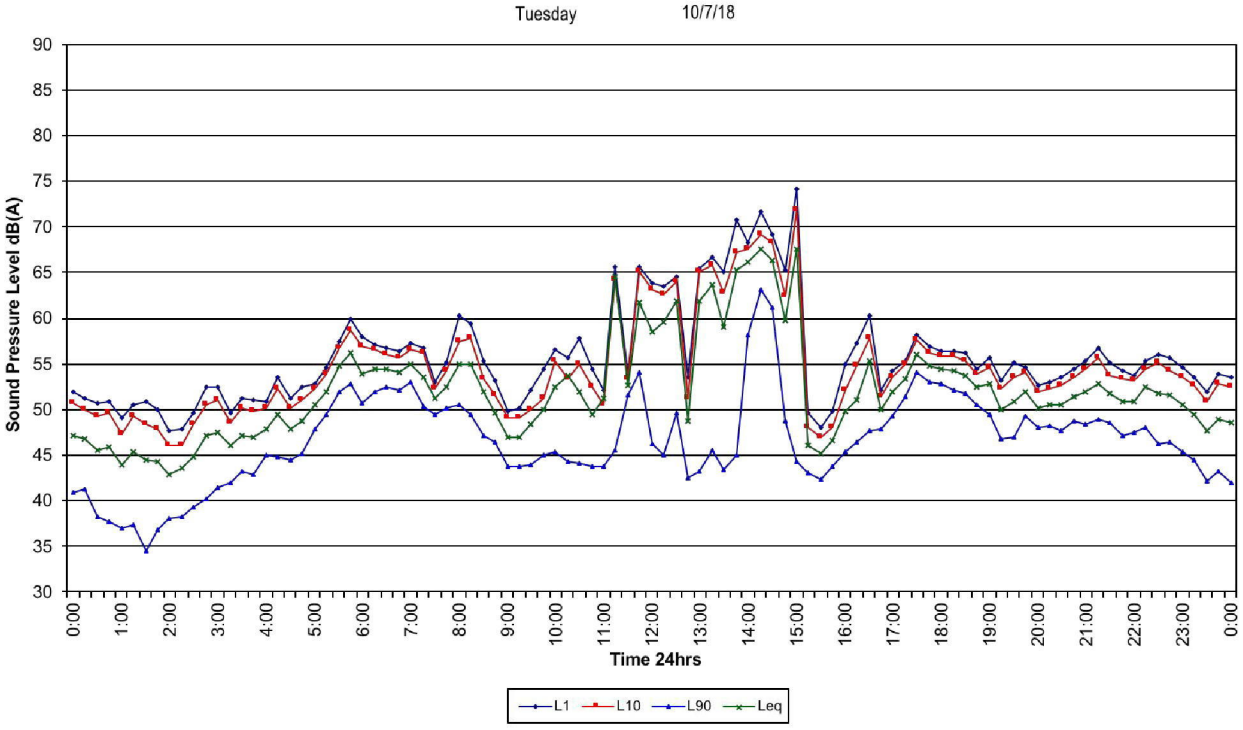
78 - 88 Tench Ave, Jamisontown



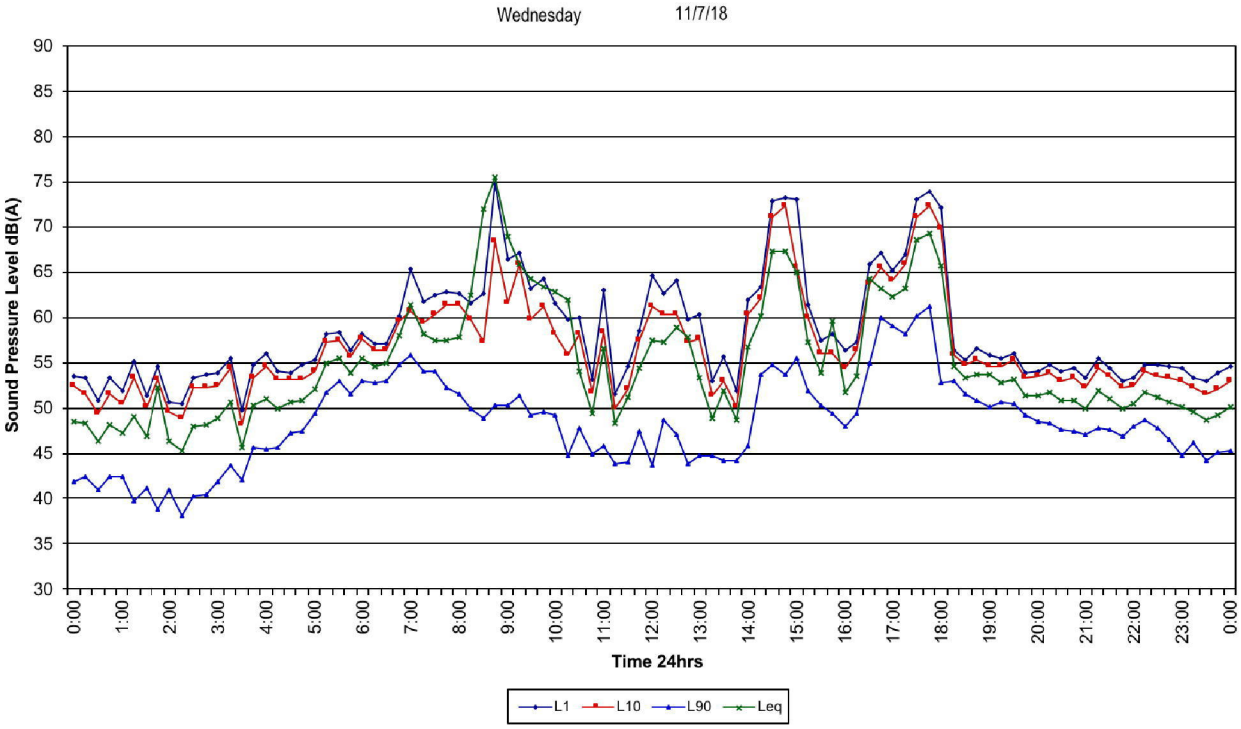
78 - 88 Tench Ave, Jamisontown



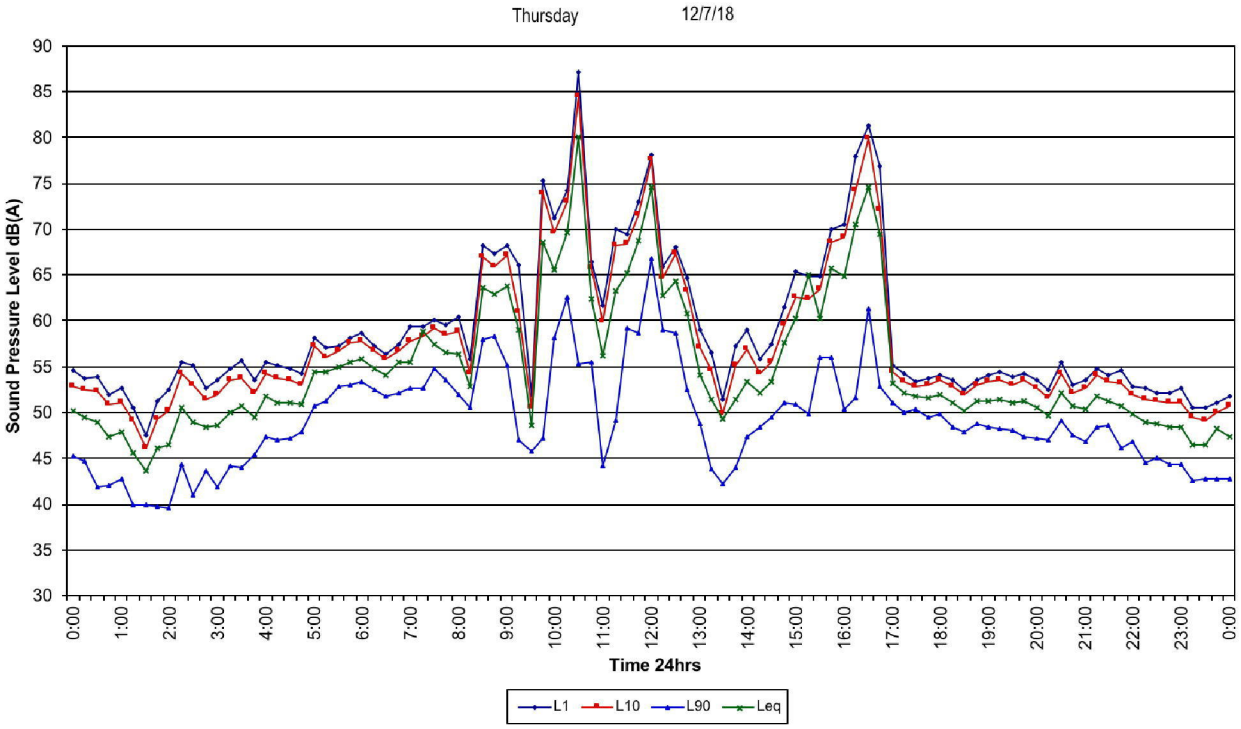
78 - 88 Tench Ave, Jamisontown



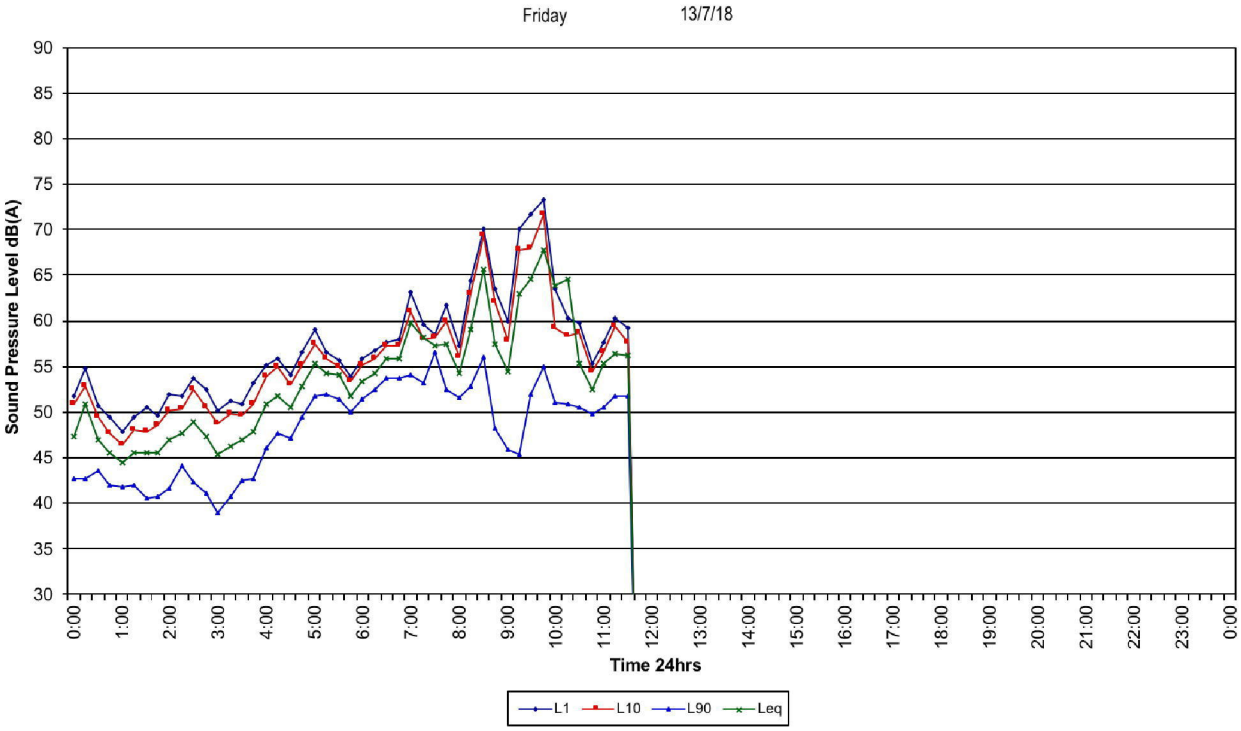
78 - 88 Tench Ave, Jamisontown



78 - 88 Tench Ave, Jamisontown



78 - 88 Tench Ave, Jamisontown



Appendix C – Calibration Certificate

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013

Calibration Certificate

Calibration Number C16718

Client Details	Rodney Stevens Acoustics Pty Ltd 1 Majura Close St Ives Chase NSW 2075
Equipment Tested/ Model Number :	Rion NL-42EX
Instrument Serial Number :	00546395
Microphone Serial Number :	144589
Pre-amplifier Serial Number :	23057

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	22.9°C	**Ambient Temperature :**	22.7°C
Relative Humidity :	51.2%	**Relative Humidity :**	50.7%
Barometric Pressure :	99.09kPa	**Barometric Pressure :**	99.04kPa

Calibration Technician :	Vicky Jaiswal	**Secondary Check:**	Riley Cooper
Calibration Date :	10/01/2017	**Report Issue Date :**	10/01/2017

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2002 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002 and because the periodic tests of IEC 61672-3:2006 cover only a limited subset of the specifications in IEC 61672-1:2002.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.12dB*	*Temperature*	*±0.05°C*
12.5kHz	*±0.18dB*	*Relative Humidity*	*±0.46%*
16kHz	*±0.31dB*	*Barometric Pressure*	*±0.017kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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