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Noise Assessment

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Proposed Mixed Use Residential and Commercial Development,
"PACIFIC PINES" Lennox Head

ENVIRONMENTAL NOISE IMPACT ASSESSMENT

06 September 2007

crgref: 07285a report

1.0 INTRODUCTION

This report is submitted in response to a request by Petrac Lennox Head atf, for an environmental noise impact assessment of a proposed mixed use residential commercial master plan in Lennox Head.

Environmental noise logging was conducted, and through modelling, assessment of road traffic noise impacts, and impacts associated with the commercial component impacting upon nearest noise sensitive landuses were produced. Based upon these predicted levels, recommendations regarding acoustic treatment and management principles have been provided.

1.1 The Proposal

The proposal is to develop the following:

- Residential areas of 600-800m^2 located across the bulk of the site;
- A neighbourhood Centre that includes a small supermarket, Tavern, medical centre, offices and service based commercial space, childcare, and an arts business centre;
- Retirement community plus an assisted and independent living facility;
- Parks and open space.

It is expected that the Tavern would operate 10am to midnight, 7 days per week, Cafés and Restaurants would operate between 7am to 10pm, 7 days per week, with other commercial premises operating standard business hours.

The main commercial node has been laid out such that the bulk of the activity will be screened by the commercial building to the residential areas surrounding the commercial site. The Supermarket main entry is proposed off Main Street, with back of house facilities in the (rear) car park area. This is deemed best practice in terms of mitigating noise from the commercial area.

1.2 Study Site Environs

The site is bounded by Montwood Drive to the south, Hendersens Lane to the north, and Hutley Drive to the west, with residential land to the east.

The main issues associated with noise across the subject site are the extra traffic generated by the residential and commercial developments impacting proposed and existing residential premises, and potential noise from the proposed commercial node impacting nearest residential premises.

For site layout master plans, refer to Figures 1 and 2 in the Appendix to this report.

2.0 EQUIPMENT

The following equipment was used to record existing noise levels in the locale:

- Rion NC 73 Calibrator;
- ARL EL315 Type II Environmental Noise Logger.

3.0 MEASUREMENT PROCEDURE

3.1 Ambient Noise Measurement

A logger was located on Hutley Drive, to the west of Silkwood Road (refer to Figure No. 1 in the appendix to this report), and set to record L_x[1] noise statistics in 15 minute blocks, continually between 11.00 a.m. Friday 22/06/07, to 2.30 pm Friday 29/06/07.

The operation of the sound level measuring equipment was field calibrated before and after the measurement session and was found to be within 0.1 dB of the reference signal. All instrumentation used in this assessment hold current calibration certificate from a certified NATA calibration laboratory. The measurement was conducted generally in accordance with Australian Standard AS1055 1997 "*Acoustics – Description & Measurement of Environmental Noise"* and Australian Standard AS2702 - 1984 '*Acoustics - Methods for the measurement of road traffic noise*'.

Weather conditions during the survey was rain over Monday to Wednesday of the week, with a temperature range of 8 to 22˚ C.

3.2 Commercial Noise Levels

All noise levels used in prediction modelling of commercial activity were sourced from previous investigations of commercial noise, and from onsite observations. Levels used were recorded as Leq, and corrected for impulsiveness or tonality as per the requirements of AS1055 1997 "*Acoustics – Description & Measurement of Environmental Noise"*.

[1] L_x Is the generic term for level exceedance statistics, i.e. L10

4.0 NOISE CRITERIA

4.1 Road Traffic Noise

Assessment of potential noise impacts resulting from the increase in road traffic volumes are required to be conducted as per the New South Wales EPA "*Environmental Criteria for Road traffic Noise*". As Hutley Drive is deemed a Sub-arterial road, and Montwood Road a collector road and Stonyhurst Road being a Local Road, the following criteria applies to the proposed development:

TYPE OF DEVELOPMENT	CRITERIA		
	DAY (7 am–10 pm) dB(A)	NIGHT (10 pm–7 am) dB(A)	WHERE CRITERIA ARE ALREADY EXCEEDED
8. Land use developments with potential to create additional traffic on collector road	$L_{Aeq(1hr)}$60	$L_{Aeq(1hr)}$55	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.
13. Land use developments with potential to create additional traffic on local roads	$L_{Aeq(1hr)}$55	$L_{Aeq(1hr)}$50	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

Table 1: Extract from the New South Wales EPA document "*Environmental Criteria for Road traffic Noise*".

As there is no standard for a Sub-arterial road under the EPA criteria, we have applied the Collector criteria to Hutley Drive.

Further to the above, we recommend applying the maximum indoor sound levels as specified in Australian Standard AS/NZS 2107:2000 *'Acoustics – Recommended Design Sound Level and Reverberation Times for Building Interiors'*. These levels expressed as L_{Aeq} are presented in Table 2 below.

Type of Occupancy / Activity	Recommended Design Sound Level, L_{Aeq}, dB(A)	
7. RESIDENTIAL BUILDINGS	Satisfactory	Maximum
Houses and apartments near major roads –		
Living areas	35	45
Sleeping areas	30	40
Work areas	35	45
Apartment common areas (e.g. foyer, lift lobby)	45	55

Table 2: Internal noise limits for residential dwellings from Australian/New Zealand Standard AS/NZS 2107:2000 *'Acoustics - Recommended design sound levels and reverberation times for building interiors'.*

4.2 Commercial Activity Noise

On-site noise associated with the proposed activities and offsite commercial premises is regulated by the NSW Industrial Noise Policy, although it was primarily intended as a guideline for large industrial uses. Such on-site noise sources include goods unloading, car door closures, and patron activity at the café, the restaurant and Tavern.

The assessment procedure has two components:

- Control of intrusive noise impacts – The limit criteria for this assessment is as follows: $L_{Aeq,\ 15\ min} \leq$ rating background level[2] + 5 dB;
- Maintaining noise level amenity for nearby residential premises. This is achieved by ensuring that the proposed development complies with the noise limit criteria set in Table 2.1 of the Policy. If we assume that the area is of an urban[3] nature (as defined in the Policy), the following limits apply:
  - Daytime (7 am – 6 pm Mon-Sat; 8 am – 6 pm Sun) 60 dB(A) L_{eq};
  - Evening (6 pm – 10 pm) 50 dB(A) L_{eq};
  - Night (remaining periods) 45 dB(A) L_{eq}.

By considering both criteria, the following noise limits apply:

- Daytime (7 am – 6 pm Mon-Sat; 8 am – 6 pm Sun) 50 dB(A) L_{eq};
- Evening (6 pm – 10 pm) 43 dB(A) Leq;
- Night (remaining periods) 38 dB(A) Leq.

[2] The rating background level is the overall single figure background level representing each assessment period (day/evening/night over the whole monitoring period. Refer to Table 3 for ambient noise levels.
[3] The Policy states that an area of a urban nature has commercial or industrial activities in the locale.

5.0 RESULTS & CALCULATIONS

5.1 Measured Levels Logger Survey

The following ambient noise levels were recorded at the logger location:

Noise Descriptor	Time Period	Measured Level dB(A)
Daytime RBL Background Level $L_{A\ 90}$	7:00am to 6:00pm	45
Evening RBL Background Level $L_{A\ 90}$	6:00pm to 10:00pm	38
Night RBL Background Level $L_{A\ 90}$	10:00pm to 7:00am	33
Road Traffic Noise Level $L_{A\ eq\ 1\ hr\ NIGHT}$	10:00pm to 7:00am	52
Road Traffic Noise Level $L_{A\ eq\ hr\ DAY}$	7:00am to 10:00pm	56
Road Traffic Noise Level $L_{A\ eq\ 24\ hr}$	Midnight to midnight	54

Table 3: Measured ambient noise levels at noise measuring location

5.2 Existing and Predicted Traffic Volumes

Traffic volumes with, and without the development (as vehicles per day – vpd) were provided by Ardill Payne & Partners as follows:

Road Name	Without Development (vpd)	With Development (vpd)
Montwood Drive	1440	2237
Stonyhurst Road	46	893
Hutley Drive	1061	3237

Table 4: Traffic volumes with and without proposed development

The above traffic volumes assumes that Hutley Drive links with Montwood Drive and is therefore extended through, and assumes a heavy vehicle percentage of 3%.

5.3 Predicted Road Traffic Noise Levels

The predicted $L_{Aeq,24hr}$, and $L_{Aeq,1hr}$ noise levels at the future Lots are as follows:

	Predicted Noise Impact Level at most exposed façade SPL dB		
Assessment Location	**$L_{Aeq,24hr}$**	**Daytime $L_{Aeq,1hr}$**	**Night time $L_{Aeq,1hr}$**
Hutley Dve without development	53	56	51
Hutley Dve with development	59	62	57
Montwood Dve without development	57	60	55
Montwood Dve with development	60	63	58

Table 5: Predicted road traffic noise levels resulting from additional traffic generated by proposed development

The above predicted impact levels assume the following:

- Impacts assessed at most exposed part of façade;
- Buildings set back 10m from traffic lane;
- Traffic speed 50km/hr;
- 3% heavy vehicles;
- Open graded asphalt road surface;
- 1% gradient on Hutley Drive;
- 12% gradient on Montwood Drive.

It should be noted that it is not possible to accurately model impacts on Stonyhurst Drive, as the CoRTN methodology (which is the required road noise prediction method) requires a minimum of 1,000 vehicles per day , which is above the total volume for this road.

We note that if a terrace is located on the screened side of the dwellings to the road, that noise impacts levels would be reduced by a further 10 dB, which would result in road traffic noise levels being well below the criteria.

5.4 Predicted Commercial Activity Noise Impact Levels

We predict the following impacts from proposed activity impacting at the nearest dwellings:

		Predicted impact level, SPL dB(A) Leq
Source	Source level L_{eq} @ 1m	Nearest Façade
Manually unloading truck in centre at grade parking commercial node	76	44
Patrons inside restaurant	73	38
Patrons Alfresco Café area	73	50
Car door closure in centre at grade parking commercial node	76	44
Medium level music in Tavern Function room	100	38
Manually unloading truck at Tavern	76	41
Medium level music in Community Hall	100	38

Table 6: Predicted noise impact levels from potential commercial activity

The above predictions assume the following:

- Alfresco dining occurs on the exposed side of the commercial buildings to dwellings;
- Car door closure occurs in car parking inside commercial node, but clear line of sight to receiver;
- Clear line of sight to dwellings from Tavern.

6.0 RECOMMENDED ACOUSTIC TREATMENTS

6.1 Recommended Acoustic Building Treatment for Control of Road Traffic Noise

We recommend applying the following principles when designing future residential premises along Hutley Drive or Montwood Road:

- Locate a terrace area on the screened side of the future building from the roadway (refer to Sketch No. 1 in the Appendix to this report for terrace location);
- Minimise openings facing the roadways;
- Non habitable spaces (e.g. garage, storage rooms or hallways) are best located on the side of the building facing the roadway;
- Provision for air conditioning or mechanical ventilation to allow occupants to close openings to mitigate road traffic noise intruding inside.

Based upon the predicted impact levels, standard construction will be sufficient to achieve the indoor noise levels as per the requirements of AS/NZ2107.

6.2 Recommended Acoustic Building Treatment for Control of Commercial Noise

- Alfresco dining be located in an area screened to surrounding residential premises, or be limited to daytime use only;
- Goods deliveries be conducted in the central at grade parking in the Commercial Node;
- Goods deliveries for all commercial premises be limited to 7am to 6pm;
- Tavern may provide amplified entertainment inside building, design must include sound locks to contain sound within building shell;
- Community Hall may provide amplified entertainment inside building, design must include sound locks to contain sound within building shell;
- Retirement facility to south-east of Community Hall should have outdoor open space areas well screened to the Community Hall area;
- Mechanical plant be designed and installed to achieve the noise limit criteria specified in Section 4.2, above.

We have assumed that the Community Hall achieves a building shell noise reduction of Rw 40, and the Tavern Rw 30.

7.0 DISCUSSION & CONCLUSIONS

The commercial area has basic noise mitigation measures integrated into the general design, with buildings located such that they screen the most active parts of the commercial area to the residential areas. This is achieved through locating the car parking in the centre of the area, with the commercial buildings around the perimeter of the parking area. By locating loading and car parking within this partially screened (and well separated by distance) location, less acoustic treatments are required.

The Tavern and Community Hall are located away from residential premises, with the nearest residential uses being the retirement community. As these retirement buildings will be multi-unit design, there are opportunities to locate open space areas away from the Tavern, and treat the buildings upon detailed design stage.

The road traffic noise impacts from Montwood Drive will be at the noise limit criteria, and is therefore in compliance with the RTA road noise criteria. Road traffic noise impacts from Hutley Drive are predicted to exceed the criteria at the most exposed facades of dwellings fronting the road. This point notwithstanding, compliance can be achieved in an outdoor recreation space, if this area is located in the screened side of a building to the road (e.g. using the building as an acoustic barrier). Standard building construction will be sufficient to achieve the indoor criteria as specified in AS/NZ2107.

Report Compiled by:

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Director

APPENDIX

Figure No. 1: Subject Site & Logger Location

Figure No. 2: Subject Site Layout & Locale

Indicative Concept Plan

- Neighbourhood Centre
- Retirement Village/ Low-medium density housing
- Residential
- Community Use
- Park

Keynotes

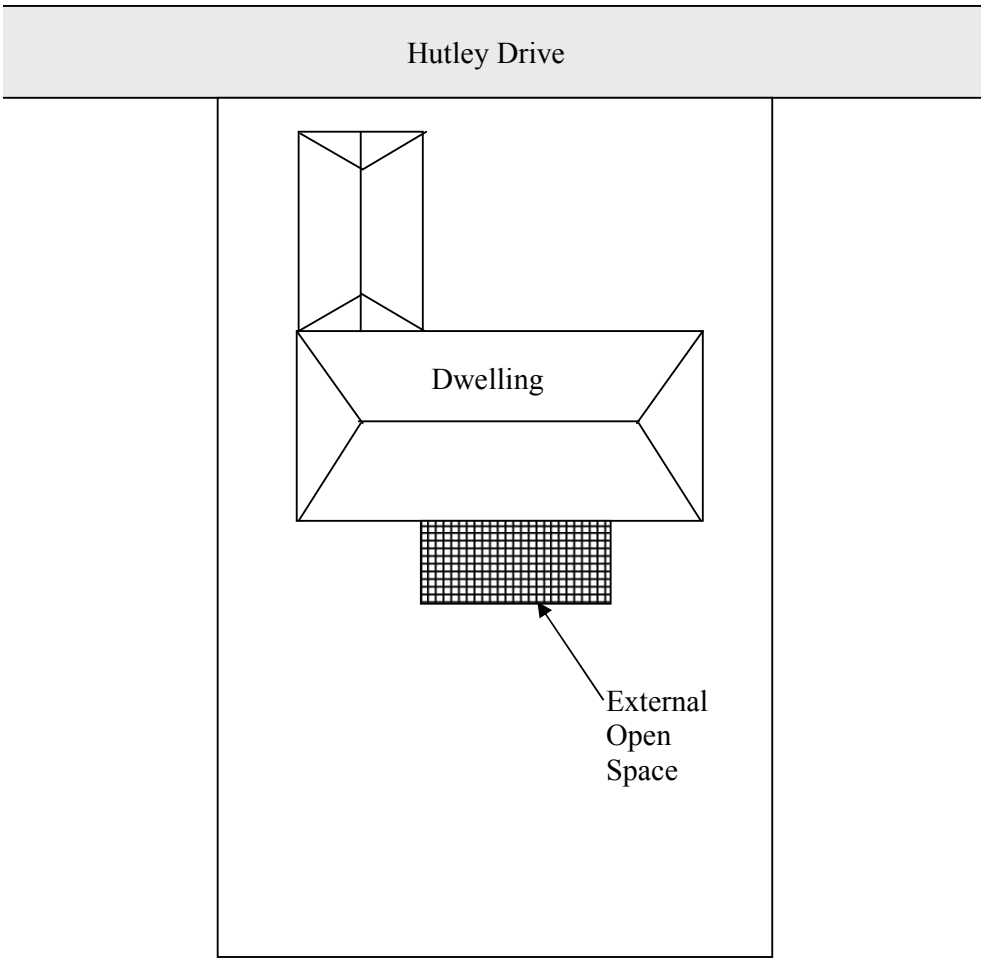
1. Neighbourhood Centre
2. Retirement Community
3. Central Pond
4. New brook and linear park
5. Sports facilities
6. Fig tree parks
7. Link to Henderson Farm
8. Hutley Drive north
9. Hutley Drive south
10. Montwood Drive link
11. Stoneyhurst Drive link
12. Central residential precinct
13. North west residential
14. Northern ridge residential
15. Eastern slope residential
16. Southern residential

Figure No. 3: Commercial Node Site Layout

The Neighbourhood Centre

Keynotes
1. Main Street
2. Hutley Drive
3. Retail core
4. Tavern
5. Medical centre
6. Arts business centre
7. Childcare centre
8. Assisted Living facility
9. Offices/service businesses
10. Home-based businesses
11. Rear parking

Sketch No. 1: Indication of Dwelling Orientation adjacent to Hutley Drive



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Montwood Road

Segment		Abbrev	Leq	Seg Group	Group Total
1	Montwood current	curren	57.3		
2	Montwood with Proposed	prop	59.9		

Total is the Leq(24hour) = 61.8 dB(A)

INPUT DATA	Seg 1 curren	Seg 2 prop
Total Flow (veh/18h)	1440	2237
Heavy Vehicles (%)	3	3
SPEED:		
Average (km/h)	50	50
Origin (Zone or Est)	Z	Z
Road RL (m)	0	0
Road Gradient (%)	12	12
ROAD SURFACE:		
Surface Type (B,C,P)	b	b
Texture Depth (mm)	1	1
Dist Road-Rec (m)	10	10
Absorbing Ground (%)	95	95
Av Prop Ht (m)	1.45	1.45
Angle View (deg)	180	180
SPECIAL ADJUSTMENT?		
Value (±dBA)		
Comment		
BARRIERS ?		
1:Dist Road-Barr (m)		
Barrier RL (m)		
Description		
2:Dist Road-Barr (m)		
Barrier RL (m)		
Description		
3:Dist Road-Barr (m)		
Barrier RL (m)		
Description		
REFLECTORS ONLY ?		
Refl Angle View (deg)		
COMBINED REFL/BARR?		
Reflector RL (m)		
Reflector Tilt (deg)		
DistanceBetween (m)		
Either on Embankment?		

Ground RL at Receiver:	0.0
Height of Receiver above ground:	1.8
Road Surface Corrections supplied by:	CRTN
Building Facade at Receiver:	Yes
User's overall adjustment to CRTN:	0.0
Leq factor: 24hr:	-3.5

CORRECTIONS		Seg 1 curren	Seg 2 prop
Total Flow 18h	(Ch3)	57.2	59.1
Low Flow 18h	(Ch12)	-1.1	-0.4
Heavy Vehicles	(Ch4)	-2.5	-2.5
{SpChange,km/h}	(Ch5)	-9.6	-9.6
Road Gradient	(Ch6)	3.6	3.6
Road Surface	(CRTN)	-1.0	-1.0
Dist Road-Rec	(Ch7)	0.0	0.0
{h,metres}	(Ch7)	1.3	1.3
Av Prop Ht	(Ch8)	-1.4	-1.4
Angle View	(Ch10)	0.0	0.0
Special	(User)	0.0	0.0
BARRIERS			
Barrier Absent	(Ch8)		
1:Pot Barr Corr	(Ch9)		
{PathDiff,metres}	(P21)		
Description			
2:Pot Barr Corr	(Ch9)		
{PathDiff,metres}	(P21)		
Description			
3:Pot Barr Corr	(Ch9)		
{PathDiff,metres}	(P21)		
Description			
Barr Multiple Effect:			
Barr Numbers			
Pot Barr Corr	(P35)		
REFLECTORS			
Refl Angle of View	(P26)		
COMBINED REFL/BARR			
Correction	(P36)		
{Y}	(P36)		
{W}	(P36)		
{Alpha}	(P36)		
{Delta1}	(P36)		
{Delta2}	(Ch13)		
{Delta3}	(Ch13)		
{Delta4}	(Ch14)		
{Delta5}	(Ch15)		

Building facade at receiver: +2.5
User's overall adjust to CRTN: 0
Leq factor: 24hr = -3.5

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Hutley Drive

Segment		Abbrev	Leq	Seg Group	Group Total
1	Hutley without proposed development	curren	52.7		
2	Hutley with proposed development	prop	59.4		

Total is the Leq(24hour) = 60.2 dB(A)

INPUT DATA	Seg 1 curren	Seg 2 prop
Total Flow (veh/18h)	1061	3237
Heavy Vehicles (%)	3	3
SPEED:		
Average (km/h)	50	50
Origin (Zone or Est)	Z	Z
Road RL (m)	0	0
Road Gradient (%)	1	1
ROAD SURFACE:		
Surface Type (B,C,P)	b	b
Texture Depth (mm)	1	1
Dist Road-Rec (m)	10	10
Absorbing Ground (%)	95	95
Av Prop Ht (m)	1.45	1.45
Angle View (deg)	180	180
SPECIAL ADJUSTMENT?		
Value (+dBA)		
Comment		
BARRIERS ?		
1:Dist Road-Barr (m)		
Barrier RL (m)		
Description		
2:Dist Road-Barr (m)		
Barrier RL (m)		
Description		
3:Dist Road-Barr (m)		
Barrier RL (m)		
Description		
REFLECTORS ONLY ?		
Refl Angle View (deg)		
COMBINED REFL/BARR?		
Reflector RL (m)		
Reflector Tilt (deg)		
DistanceBetween (m)		
Either on Embankment?		

Ground RL at Receiver:	0.0
Height of Receiver above ground:	1.8
Road Surface Corrections supplied by:	CRTN
Building Facade at Receiver:	Yes
User's overall adjustment to CRTN:	0.0
Leq factor: 24hr:	-3.5

CORRECTIONS		Seg 1 curren	Seg 2 prop
Total Flow 18h	(Ch3)	55.9	60.7
Low Flow 18h	(Ch12)	-1.9	0.0
Heavy Vehicles	(Ch4)	-1.7	-1.7
{SpChange,km/h}	(Ch5)	-0.8	-0.8
Road Gradient	(Ch6)	0.3	0.3
Road Surface	(CRTN)	-1.0	-1.0
Dist Road-Rec	(Ch7)	0.0	0.0
{h,metres}	(Ch7)	1.3	1.3
Av Prop Ht	(Ch8)	-1.4	-1.4
Angle View	(Ch10)	0.0	0.0
Special	(User)	0.0	0.0
BARRIERS			
Barrier Absent	(Ch8)		
1:Pot Barr Corr	(Ch9)		
{PathDiff,metres}	(P21)		
Description			
2:Pot Barr Corr	(Ch9)		
{PathDiff,metres}	(P21)		
Description			
3:Pot Barr Corr	(Ch9)		
{PathDiff,metres}	(P21)		
Description			
Barr Multiple Effect:			
Barr Numbers			
Pot Barr Corr	(P35)		
REFLECTORS			
Refl Angle of View	(P26)		
COMBINED REFL/BARR			
Correction	(P36)		
{Y}	(P36)		
{W}	(P36)		
{Alpha}	(P36)		
{Delta1}	(P36)		
{Delta2}	(Ch13)		
{Delta3}	(Ch13)		
{Delta4}	(Ch14)		
{Delta5}	(Ch15)		

Building facade at receiver: +2.5
User's overall adjust to CRTN: 0
Leq factor: 24hr = -3.5

Manually unloading truck in commercial centre	76	dB(A) Leq @ 1m
Distance to receiver	55	m
Distance attenuation	-34.8	dB(A)
Obstructions		dB(A)
Façade reflection	2.5	dB(A)
Impact at façade	43.7	dB(A)
Patrons inside restaurant/café	73	dB(A) Leq @ 1m
Distance to receiver	25	m
Distance attenuation	-28	dB(A)
Inside to outside	-10	dB(A)
Façade reflection	2.5	dB(A)
Impact at façade	37.5	dB(A)
Patrons restaurant/café Alfresco	73	dB(A) Leq @ 1m
Distance to receiver	20	m
Distance attenuation	-26	dB(A)
Obstructions	0	dB(A)
Façade reflection	2.5	dB(A)
Impact at façade	49.5	dB(A)
Car door closure at grade parking commercial	76	dB(A) Leq @ 1m
Distance to receiver	55	m
Distance attenuation	-34.8	dB(A)
Obstructions	0	dB(A)
Façade reflection	2.5	dB(A)
Impact at façade	43.7	dB(A)
Low level amplified music in Tavern	100	dB(A) Leq @ 1m
Distance to receiver	75	m
Distance attenuation	-37.5	dB(A)
Inside to outside closed doors	-25	dB(A)
Façade reflection	2.5	dB(A)
Impact at façade	40.0	dB(A)
Manually unloading truck at Tavern	76	dB(A) Leq @ 1m
Distance to receiver	75	m
Distance attenuation	-37.5	dB(A)
Obstructions	0	dB(A)
Façade reflection	2.5	dB(A)
Impact at façade	41.0	dB(A)
Low level amplified music in Community Hall	100	dB(A) Leq @ 1m
Distance to receiver	30	m
Distance attenuation	-29.5	dB(A)
Inside to outside closed doors	-35	dB(A)
Façade reflection	2.5	dB(A)
Impact at façade	38.0	dB(A)