

Il Capitano Investments Pty

Memorial Ave, Liverpool

Acoustic DA Assessment

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1 Introduction

The following report has been prepared by Acouras Consultancy on behalf of Il Capitano Investments Pty to assess the potential for noise impact associated with the Memorial Ave, Liverpool. The residential development will include:

- Three (3) basement level carpark.
- Restaurant, retail and commercial space on ground floor.
- Common outdoor area, gym and outdoor pool on level 1.
- Residential apartment on level 1 to level 23.

The proposed residential development is surrounded by existing residential buildings. Traffic noise on the surround roads, such as Memorial Ave and Castlereagh Street contributes to the surrounding ambient noise levels. The site location is shown in Figure 1.



Figure 1 – Site Location, Nearest Residents and Noise Logger Position

2 Noise Criteria

The following standards and guidelines are applicable to this project:

- Liverpool City Council DCP (2008) Part 4 “Development in the Liverpool City Centre”.
- NSW Department of Planning “Development Near Rail Corridors and Busy Roads”.
- NCC/BCA Part F5.
- NSW EPA “Noise Policy for Industry” (NPI) and “Noise Guide for Local Government” (NGLG).
- Australian standard AS/NZS 2107-2016: Acoustics – Recommended design sound levels and reverberation times for building interiors.
- Australian standard AS 1055.1-1997: Acoustics – Description and measurement of environmental noise - General procedures.

2.1 Internal Noise Levels

For the residential development, the Liverpool City Council DCP (2008) has no specific acoustic requirements and therefore Department of Planning “Development Near Rail Corridors and Busy Roads” requires the following L_{Aeq} levels are not exceeded.

Table 1— Development near Rail Corridors and Busy Roads – Interim Guideline

Residential Space	Internal Noise Criteria
in any bedroom in the building	35dB(A) at any time 10pm–7am
anywhere else in the building (other than a garage, kitchen, bathroom or hallway)	40dB(A) at any time

Mitigation measures are based on having windows and external doors closed. If internal noise levels with windows or doors open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia.

The AS/NZS 2107–2016 outlines the acceptable internal noise levels such that a satisfactory acoustic environment within non-residential spaces in new and existing buildings can be achieved. Table 2 presents the recommended internal design noise levels.

Table 2— Recommended Internal Design Noise Levels (AS/NZS 2107)

Type of occupancy/activity	Design sound level ($L_{Aeq,t}$) range
Apartment common areas (e.g. foyer, lift lobby)	45 to 50
Small retail stores (general)	< 50
Restaurant	40 to 50
Gym	< 50
General office	40 to 45
Enclosed Carparks	< 65

2.2 Sound Insulation Requirement (Part F5 NCC/BCA)

For sound transmission and insulation between sole occupancy units (SOU) within the same development, walls and floors to be constructed in accordance with requirements of Part F5 of the Building Code of Australia (BCA). Sound insulation requirements are summarised in Table 3.

Table 3 - NCC Part F5 Requirements (Class 2 or 3)

Building Element	Minimum NCC Part F5 Requirements
Sound Insulation Rating of Walls (Class 2 or 3)	
Walls between separate sole occupancy units.	Rw + Ctr 50 (airborne)
Walls between wet areas (bathrooms, sanitary compartment, laundry or kitchen) and a habitable room (other than kitchen) in adjoining apartments.	Rw + Ctr 50 (airborne) & of discontinuous construction
Walls between sole occupancy unit and stairway, public corridors, public lobby or the like or parts of a different classification.	Rw 50 (airborne)
Walls between a plant room or lift shaft and a sole occupancy unit.	Rw 50 (airborne) & of discontinuous construction
Sound Insulation Rating of Floors (Class 2 or 3)	
Floors between sole occupancy units or between a sole occupancy unit and plant room, lift shaft, stairway, public corridor, public lobby or the like.	Rw + Ctr 50 (airborne) & Ln,w + CI < 62 (impact)
Apartment Entry Doors (Class 2 or 3)	
A door incorporated in a wall that separates a sole-occupancy unit from a stairway, public corridor, public lobby or the like.	Rw 30 (airborne)
Services (Class 2, 3 or 9c)	
If a storm water pipe, a duct, soil, waste or water supply pipe including a duct or pipe that is located in a wall or floor cavity serves or passes through more than one sole occupancy unit must be separated:	
if the adjacent room is a habitable room (other than a kitchen); or	Rw + Ctr 40
if the room is a kitchen or non-habitable room	Rw + Ctr 25

Construction Deemed to Satisfy

The forms of construction must be installed as follows:

- (a) Masonry—Units must be laid with all joints filled solid, including those between the masonry and any adjoining construction.
- (b) Concrete slabs—Joints between concrete slabs or panels and any adjoining construction must be filled solid.
- (c) Sheeting materials—
 - (i) if one layer is required on both sides of a wall, it must be fastened to the studs with joints staggered on opposite sides; and
 - (ii) if two layers are required, the second layer must be fastened over the first layer so that the joints do not coincide with those of the first layer; and
 - (iii) joints between sheets or between sheets and any adjoining construction must be taped and filled solid.
- (d) Timber or steel-framed construction—perimeter framing members must be securely fixed to the adjoining structure and—
 - (i) bedded in resilient compound; or
 - (ii) the joints must be caulked so that there are no voids between the framing members and the adjoining structure.
- (e) Services—
 - (i) Services must not be chased into concrete or masonry elements.
 - (ii) A door or panel required to have a certain $R_w + C_{tr}$ that provides access to a duct, pipe or other service must—
 - (A) not open into any habitable room (other than a kitchen); and
 - (B) be firmly fixed so as to overlap the frame or rebate of the frame by not less than 10 mm, be fitted with a sealing gasket along all edges and be constructed of—
 - (aa) wood, particleboard or blockboard not less than 33 mm thick; or
 - (bb) compressed fibre reinforced cement sheeting not less than 9 mm thick; or
 - (cc) other suitable material with a mass per unit area not less than 24.4 kg/m²
 - (iii) A water supply pipe must—
 - (A) only be installed in the cavity of discontinuous construction; and
 - (B) in the case of a pipe that serves only one sole-occupancy unit, not be fixed to the wall leaf on the side adjoining any other sole-occupancy unit and have a clearance not less than 10 mm to the other wall leaf.
 - (iv) Electrical outlets must be offset from each other—
 - (A) in masonry walling, not less than 100 mm; and
 - (B) in timber or steel framed walling, not less than 300 mm.

2.3 Noise Survey and Project Specific Limits

An unattended noise survey was carried out at the site to measure the background and ambient noise levels. Noise monitoring was conducted between Monday 9th to Monday 23rd July 2018. The monitor was positioned (as shown in Figure 1) at the following locations:

- Location 1 (L1) – First level balcony at the corner of Memorial Ave and Castlereagh Street.
- Location 2 (L2) – On the awning along Castlereagh Street.

Measurements were conducted using the following equipment:

- SVAN 977 Type 1 Real time Analyser/Noise Logger. Serial No. 34892.
- SVAN SV30A Type 1 Sound Level Calibrator. Serial No. 31830.

Noise monitoring was conducted in general accordance with Australian standard AS 1055.1-1997: Acoustics-Description and measurement of environmental noise-General procedures.

The noise analyser was calibrated immediately before and after measurements were taken with no discernible differences between these two recorded levels. The sound analyser is Type 1 and complies with Australian standard AS1259.2: 1990.

During the monitoring period any adverse weather condition have been excluded. The noise logger results are presented in Appendix C.

2.3.1 Traffic Noise Levels

Table 4 presents a summary of the measured ambient noise level and traffic noise impacting the development.

Table 4 – Measured Ambient and Traffic Noise and Levels, dBA

Location	Period	Average L_{eq}	Highest L_{eq} 1hr
L1	Day (07:00-22:00)	64	68
	Night (22:00-07:00)	59	64
L2	Day (07:00-22:00)	59	64
	Night (22:00-07:00)	55	62

By analysing measured data, the impact of the surrounding traffic noise on Memorial Ave and Bathurst Street have been calculated by applying the CRTN method for predicting noise traffic noise using CadnaA (version 4.5.149) noise modelling software.

The following Figure 2 and Figure 3 shows the predicted impact of traffic noise during the daytime and night time periods respectively including the traffic generated by the development.

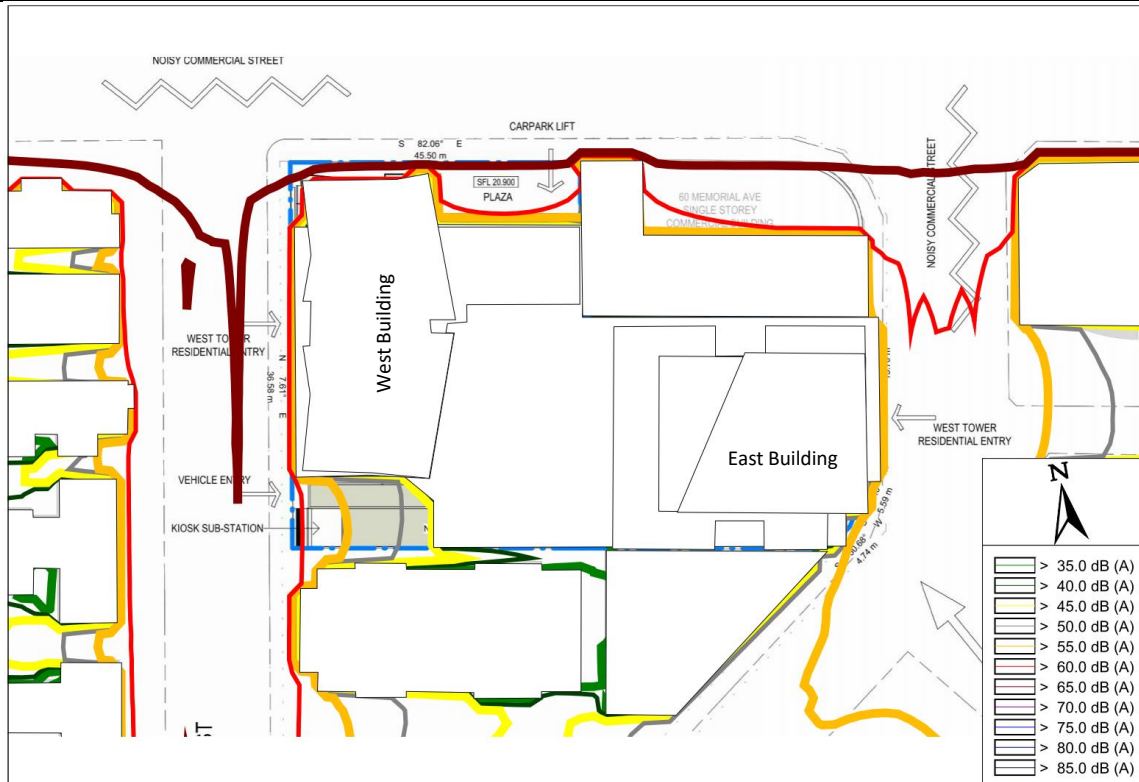


Figure 2 – Daytime Traffic Noise Contour (Ground Level)



Figure 3 – Night-Time Traffic Noise Contour (Ground Level)

2.3.2 Project Noise Limits

Liverpool City Council DCP (2008) does not have any specific guide for controlling noise emission from the operation of mechanical equipment associated with the development. However, the EPA Noise Guide for Local Government (NGLG) does provides a guide into considering intrusive impact to nearby receivers from this residential development.

The assessment of intrusive noise levels has been conducted in general accordance with the procedures as set out in the NSW NPI, which defines intrusive noise as 5 decibels above the background noise level. For the purpose of the assessment, the background noise level has been determined using the RBL. In addition to the intrusive noise criteria, noise from this equipment must not be able to be heard in a habitable room in a neighbouring residence during the restricted hours.

Table 5 presents a summary of the measured background noise level and the allowable intrusive noise limit for this project in accordance with the EPA. For the purpose of the assessment, the background noise level has been determined using the RBL in accordance with the method given in the EPA "Noise Policy for Industry" (NPI).

Table 5—Noise Limits for Residential, dBA

Location	Time Period	Existing Noise Levels		EPA Noise Limits, Leq
		Leq (period)	RBL	
L1	Day	64	55	60
	Evening	63	51	56
	Night	59	43	48
L2	Day	60	51	56
	Evening	57	48	53
	Night	55	40	45

For commercial spaces, we recommend that operational noise be assessed in accordance with the procedures as set out in the NSW NPI. Table 6 presents a summary of the measured background noise level and the allowable intrusive noise limit for this project. The amenity criteria are based on a urban receiver.

Table 6—Noise Limits for Commercial & Retail, dBA

Location	Time Period	Existing Noise Levels		NSW EPA NPI			Project Noise Trigger Level Leq(15min)
		Leq (period)	RBL	Recommended ANL	Project ANL ¹ Leq(15min)	Intrusiveness Criteria, Leq(15min)	
L1	Day	64	55	60	58	60	58
	Evening	63	51	50	48	56	48
	Night	59	43	45	43	48	43
L2	Day	60	51	60	58	56	56
	Evening	57	48	50	48	53	48
	Night	55	40	45	43	45	43

During detailed design stage, the design and selection of the mechanical equipment required to service the proposed development will be required to achieve the DCP noise limits as presented in the table above.

¹ 2. Project ANL is recommended ANL minus 5 dB(A) and plus 3 dB(A), to convert from a period level to a 15-minute level.

2.4 Traffic Noise Generation

The development has the potential to generate increased traffic noise on the surround roads, such as Memorial Ave, Castlereagh St, Bathurst St and Norfolk Street will be assessed in accordance with the NSW EPA Road Noise Policy (RNP).

Table 7 sets out the assessment criteria for residences to be applied to particular types of project, road category and land use.

Table 7— Road traffic noise assessment criteria for residential land uses

Road Category	Type of project/land use	Assessment Criteria - dBA	
		Day (7am-10pm)	Night (10pm-7am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	L_{Aeq} , (15 hour) 60 (external)	L_{Aeq} , (9 hour) 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	L_{Aeq} , (1 hour) 55 (external)	L_{Aeq} , (1 hour) 50 (external)

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

3 Assessment and Recommendations

3.1 Façade Glazing Requirements

Acoustic glazing for the apartments are given in Table 8 are required to reduce noise impact on the internal occupants and should result in noise levels within such units in accordance with the Department of Planning Noise Guidelines and AS/NZS 2107:2016.

Table 8 – Schedule of Window and Glazing (R_w)

Level	Façade	Space	Glazing Thickness	Minimum R _w (Glazing+Frame)
Retail/Commercial Levels				
G	All	Restaurant	6.38mm laminated	30
		Retail	6.38mm laminated	30
		Commercial	6.38mm laminated	30
1	All	Restaurant	6.38mm laminated	30
	All	Gym	6.38mm laminated	30
Residential West Building				
1	All	Living & Bedrooms	10.38mm laminated	32
2-23	North	Living	10.38mm laminated	32
		Bedrooms	12.5mm laminated (Viridian Acoustic)	40
	West	Living & Bedrooms	10.38mm laminated	32
	South & East	Living	6.38mm laminated	30
		Bedrooms	10.38mm laminated	32
Residential East Building				
1-17	North & East	Living & Bedrooms	10.38mm laminated	32
	South & West	Living	6.38mm laminated	30
		Bedrooms	10.38mm laminated	32

All other non-habitable spaces, such as bathrooms and laundries require minimum 6mm monolithic glass (Rw 28). All Windows/doors should be well sealed (air tight) when closed with good acoustic seals around the top and bottom sliders. Mohair seals are not considered to be acoustic seals.

3.2 Building Façade Construction

To provide sufficient acoustic attention of noise, the general external construction of the proposed building would need to be constructed as detailed in Table 9.

Table 9 – External Façade Construction (R_w)

Building Element	Proposed Construction	Minimum R _w
External Wall	Masonry or precast concrete with internal plasterboard lining. Insulation in wall cavity as per BASIX requirements.	50
Roof and ceiling	Concrete with a plasterboard cavity ceiling. Insulation in ceiling cavity as per BASIX requirements.	50

3.3 Mechanical Services

At the DA stage, the design and selection of mechanical equipment has not been finalised. Following the DA approval of the proposed development, during the Construction Certification Stage a detail assessment of all mechanical plant and equipment will be conducted to ensure compliance with the EPA and DCP noise criteria. Typical acoustic measures may include the construction of acoustic barriers, enclosures, attenuators and/or acoustic louvres.

3.4 Separation Between Commercial and Residential

The wall partition and floor slab separating the retail/commercial space and the residential apartment is to be of solid masonry/concrete construction with a minimum sound insulation performance of R_w + C_{tr} 50 for airborne noise.

At this stage, the activities of the future tenant that have the potential to create noise is not known. Any operation of the retail/commercial space is to comply with the EPA Industrial Noise Policy and the any other relevant Council consent conditions related to the use.

A separate DA assessment would be submitted prior to occupation detailing proposed use and to ensure that any potential noise impacting the amenity of the adjoining residence is protected.

3.5 Assessment of Traffic Noise Generation

This section details a review of the expected future traffic noise generated from the development. Based on the analysis prepared by GTS Consultants, the proposed development will result in an increase in the traffic generation as summaries in Table 10.

The change in traffic noise levels have been used to in the noise model to assess the impact on the surround roads.

Table 10 – Predicted Change Traffic Noise Levels during Peak Periods

Road	Period	Existing Peak Traffic Flow	Net Increase Peak Traffic Flow	Change in Traffic Noise, dBA
Memorial Ave	AM Peak	1070	0	0.0
	PM Peak	915	0	0.0
Castlereagh St (North)	AM Peak	89	69	2.5
	PM Peak	105	59	1.9
Castlereagh St (South)	AM Peak	117	83	2.3
	PM Peak	139	102	2.4
Bathurst St	AM Peak	1073	0	0.0
	PM Peak	1367	0	0.0
Norfolk St	AM Peak	69	36	1.8
	PM Peak	92	45	1.7

3.6 Commercial Delivery and Waste Collection Vehicles

For all delivery vehicles and privately operated waste collection vehicles used for the commercial and retail, Part 4.3.3 of EPA Noise Guide for Local Government it is recommends the following time restrictions:

- Before 8.00 am or after 8.00 pm on any Saturday, Sunday or public holiday.
- Before 7.00 am or after 8.00 pm on any other day.

This excludes residential motor vehicles entering of existing the premises.

Additional management controls of the delivery and rubbish collection vehicles to minimise noise impact to the units on ground floor could include:

- Using up-to-date equipment that uses 'quieter' technology such as low-noise bin lifters.
- Maintaining rubbish trucks and braking materials to minimise or eliminate noise such as squeaky brakes.
- Educating drivers and collectors to be careful and to implement quiet work practices.
- Setting more appropriate times for the rubbish collection.

4 Conclusion

An acoustic assessment of the proposed development has been carried out in accordance with the requirements of Liverpool City Council DCP and the Department of Planning.

An environmental noise survey of the site has been conducted and the noise limiting criteria for mechanical plant/equipment noise emission has been determined based on the EPA. The limits are presented in Table 5.

Construction for glazing, external walls and the roof/ceiling systems have been provided to achieve the internal noise criteria and are detailed in Section 3.1 and Section 3.2 based on the impact of road traffic noise.

Providing the recommendations in this report are implemented, the noise from the proposed development is predicted to comply with acoustic requirements of the Liverpool City Council DCP, EPA noise limits, Department of Planning, BCA Part F5 and relevant Australian standards.

Appendix A – Acoustic Terminology

Decibel, dB: A dimensionless unit which denotes the ratio between two quantities that are proportional to power, energy or intensity. One of these quantities is a designated reference by which all other quantities of identical units are divided. The sound pressure level in decibels is equal to 10 times the logarithm (to the base 10) of the ratio between the pressure squared divided by the reference pressure squared. The reference pressure used in acoustics is 20 micro Pascals.

A-WEIGHTING: A measure of sound pressure level designed to reflect the response of the human ear, which does not respond equally to all frequencies. To describe sound in a manner representative of the human ear's response it is necessary to reduce the effects of the low and high frequencies with respect to medium frequencies. The resultant sound level is said to be A-weighted, and the units are in decibels (dBA). The A-weighted sound level is also called the noise level.

Sound Pressure Level, L_p (dB), of a sound: 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 micro Pascals. Sound pressure level is measured using a microphone and a sound level meter, and varies with distance from the source and the environment.

Ambient Noise/Sound: All noise level present in a given environment, usually being a composite of sounds from many sources far and near. Traffic, HVAC, masking sound or even low-level background music can contribute to ambient level of noise or sound.

Percentile Level - L_{90} , L_{10} , etc: A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, e.g. L_{90} is the level which is exceeded for 90% of a measurement period. L_{90} is commonly referred to as the "background" sound level.

Background Noise (L_{90}): The sum total of all unwanted residual noise generated from all direct and reflected sound sources in a space that can represent an interface to, or interfere with good listening and speech intelligibility.

Rating Background Level – RBL: Method for determining the existing background noise level which involves calculating the tenth percentile from the L_{A90} measurements. This value gives the Assessment Background Noise Level (ABL). Rating Background Level is the median of the overall ABL.

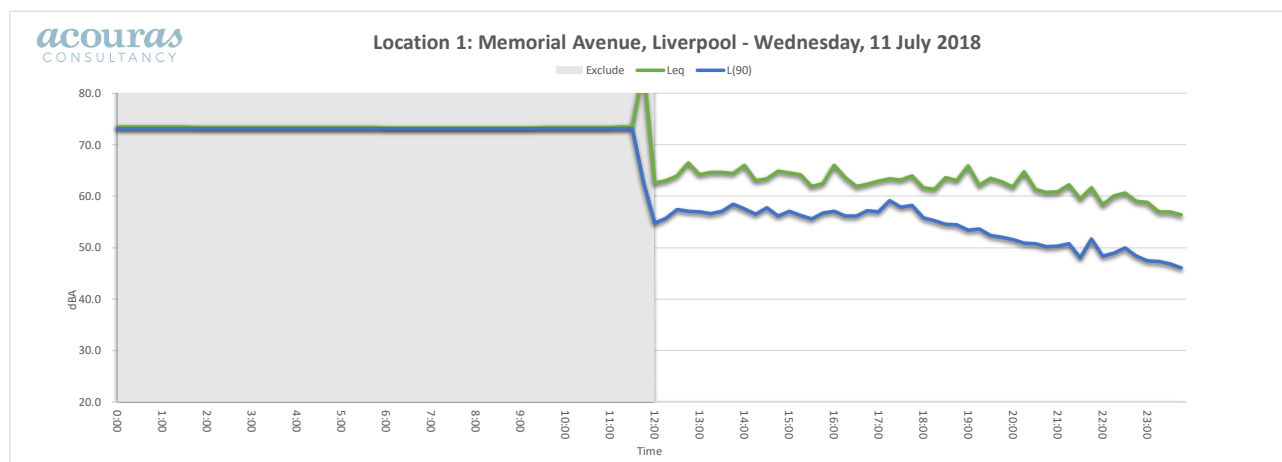
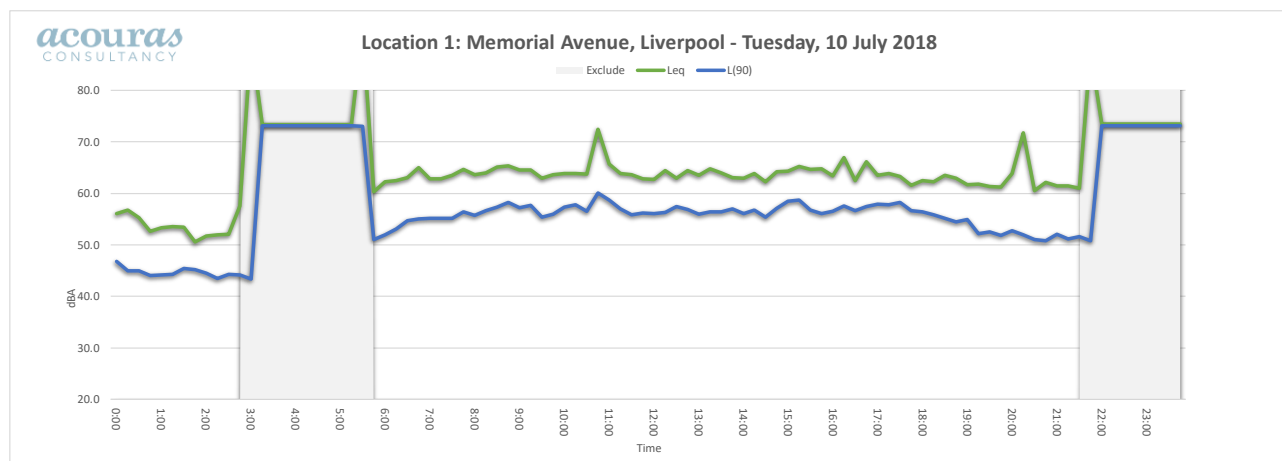
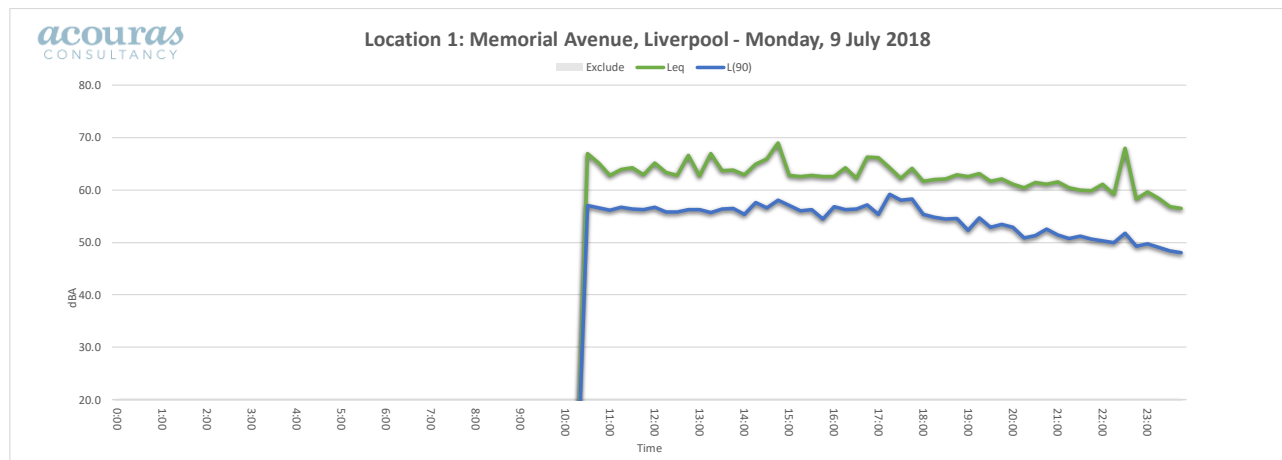
$L_{AEQ,T}$: Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

Appendix B – Architectural Drawings

This assessment was based on the following architectural drawings provided by Allen Jack + Cottier (AJ+C).

Drawing	Issue	Date	Description
DA0000	1	22-02-19	Cover Page
DA1001	1	22-02-19	Site Plan
DA1002	1	22-02-19	North Elevation Streetscape
DA1003	1	22-02-19	East & West Streetscape
DA2000	1	22-02-19	Ground Floor Plan
DA2001	1	22-02-19	Basement 1 Plan
DA2002	1	22-02-19	Basement 2 Plan
DA2003	1	22-02-19	Basement 3 Plan
DA2101	1	22-02-19	Level 1 Plan
DA2102	1	22-02-19	Level 2 Plan
DA2103	1	22-02-19	Level 3 Plan
DA2104	1	22-02-19	Level 4 Plan
DA2105	1	22-02-19	Level 5 Plan
DA2106	1	22-02-19	Level 6 Plan
DA2107	1	22-02-19	Level 7 Plan
DA2108	1	22-02-19	Level 8 Plan
DA2109	1	22-02-19	Level 9-17 Plan
DA2118	1	22-02-19	Level 18-23 Plan
DA2124	1	22-02-19	Roof Plan
DA3101	1	22-02-19	North Elevation-Memorial Avenue
DA3102	1	22-02-19	West Elevation-Castlereagh Street
DA3103	1	22-02-19	South Elevation
DA3104	1	22-02-19	East Elevation-Bathurst Street
DA3105	1	22-02-19	East and West Courtyard Elevations

Appendix C – Noise Logger Results



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SYD2018-1055-R001E

11/03/2019

