64 Bathurst Street, Liverpool

DA Acoustic Assessment

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) have been engaged to conduct an acoustic assessment of the potential noise impacts associated with the proposed mixed-use development at 64 Bathurst Street, Liverpool.

In this report we will:

- Conduct an external noise (traffic) impact assessment and recommend acoustic treatments to ensure that a reasonable level of amenity is achieved for future tenants.

- Identify potential noise generating sources associated with the subject proposal and determine relevant noise emission goals, ensuring that nearby developments are not adversely impacted by the subject proposal.

Noise impacts will be addressed in accordance with the following standards and guidelines;

- Liverpool Development Control Plan (DCP) 2008.

- Australian and New Zealand Standard AS/NZS 2107:2016 *'Acoustics - Recommended design sound levels and reverberation times for building interiors'*.

- NSW Department of Planning State Environmental Planning Policy (Infrastructure SEPP) 2007.

- NSW Environmental Protection Authority (EPA) Industrial Noise Policy (INP).

- NSW EPA Protection of Environmental Operations Regulation 2008.

ALC confirms that the proposed development can comply with all of the aforementioned authorities and standards, on the proviso that the acoustic treatments nominated in this report are adopted.

This assessment is based on architectural drawings by Sanders Global (DA00-35 Revision A).

2 SITE DESCRIPTION

The site comprises one parcel of land legally described as Lot 10 DP 816556 with a total site area of 2,924 square metres (sqm). Huckstepp Serviceway dissects the site in a north-south direction, creating two distinct and separate portions of land, as described and shown in figure 1 below.

The western portion of the site (64 Bathurst Street) is currently occupied by on grade carparking space and is bounded by Bathurst Street to the west (and residential apartments on the other side of Bathrurst Street), Huckstepp Serviceway to the east, an existing commercial property to the north and on grade carparking to the south. An existing 8 storey commercial property occupies the eastern portion of the site, at 203-209 Northumberland Street and is bounded by Northumberland Street to the east, Huckstepp Serviceway to the north and west, and a Centrelink property to the south.

Bathurst Street is a four lane (only two driving lanes) local road with medium to low volumes of traffic. Northumberland Street is a two lane local road with low volumes of traffic.

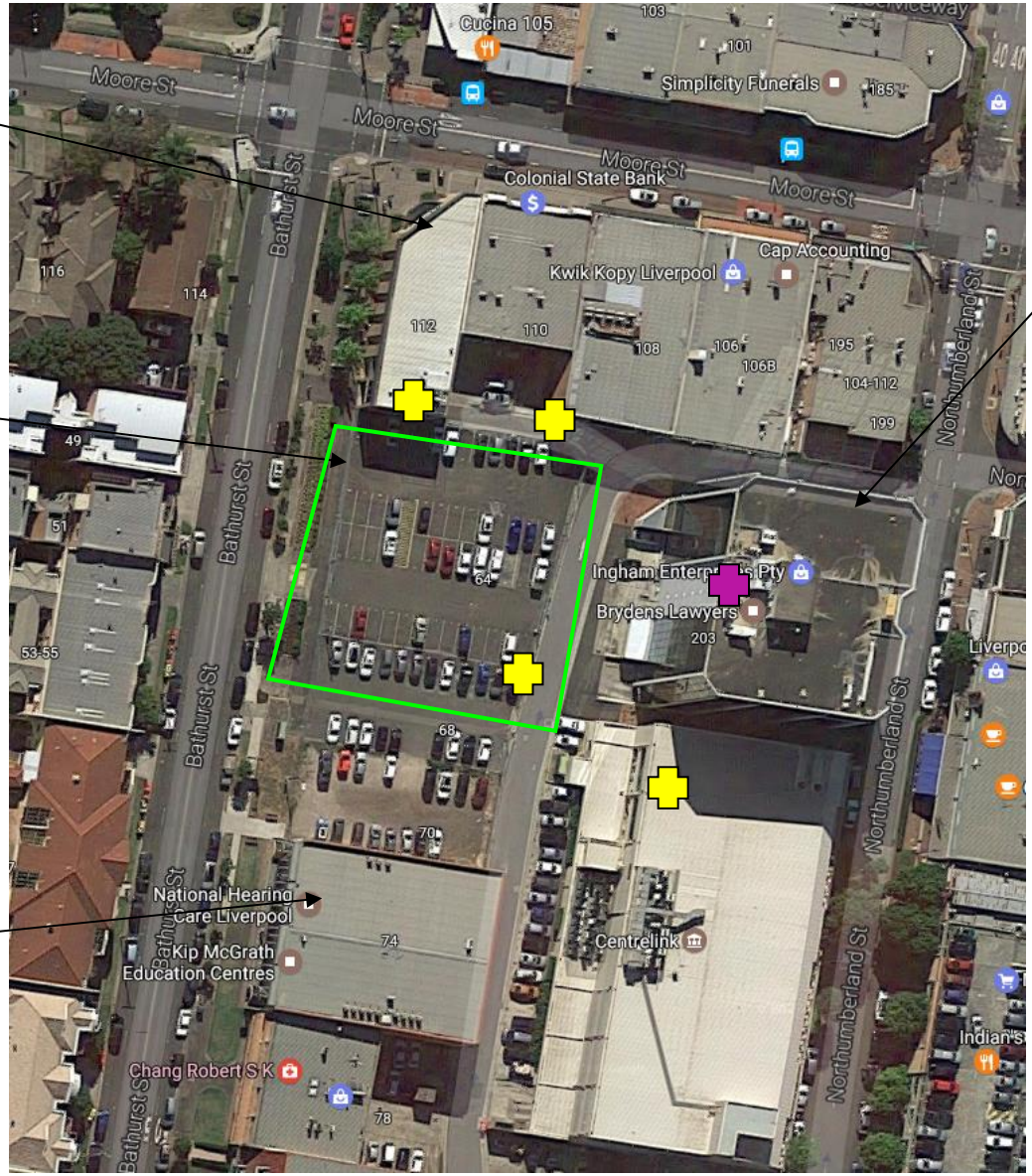
The DA seeks approval from Liverpool City Council (Council) for the construction of a mixed-use development at Lot 10 DP 816556 in the Liverpool City Centre (DA No. 767/2016). The proposed mixed-use development comprises:

- Basement (4 levels).
- Ground floor - Four retail tenancies, and loading dock.
- Three storey podium with communal area on Level 4.
- Residential tower (levels 5- 21)

Existing commercial property to the north 106-112 Moore Street, Liverpool

Subject Site – 64 Bathurst Street, Liverpool

Existing commercial property to the south 74 Bathurst Street, Liverpool



Subject Site – 203-209 Northumberland Street

Unattended Noise Monitor Location

Attended Noise Measurement Locations

3 NOISE DESCRIPTORS

In the case of environmental noise three principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement interval.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4 EXTERNAL NOISE IMPACT ASSESSMENT

4.1 ASSESSMENT OBJECTIVES

4.1.1 Liverpool DCP 2008

Section 9 of part 3.7 the Liverpool City Council DCP 2008 outlines the following controls with regards to acoustic impact,

1. *Noise attenuation measures should be incorporated into building design to ensure acoustic privacy between on-site and adjoining buildings.*

2. *Buildings having frontage to a Classified Road or a railway and impacted upon by rail or traffic related noises must incorporate the appropriate noise and vibration mitigation measures into the design in terms of the site layout, building materials and design, orientation of the buildings and location of sleeping and recreation areas.*

3. *The proposed buildings must comply with the Environment Protection Authority criteria and the current relevant Australian Standards for noise and vibration and quality assurance.*

4.1.2 State Environmental Planning Policy (SEPP Infrastructure) 2007

Clause 102 of the NSW SEPP for road traffic noise stipulates,

"This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:

(a) a building for residential use,
(b) a place of public worship,
(c) a hospital,
(d) an education establishment or child care centre.

If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

(a) in any bedroom in the building – 35 dB(A) at any time between 10 pm and 7am,

(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40 dB(A) at any time."

Map 14 of the traffic volume maps for Infrastructure SEPP (from the road and maritime services website) does not classify Bathurst or Northumberland Streets as carriageways carrying more than 20,000 vehicles, and hence the subject proposal is not governed by the provisions of the Infrastructure SEPP.

Hume Highway is located approximately 240m to the west of the subject site. Any noise impacts on site resultant from vehicle movements along Hume Highway, has been measured by the long-term noise monitor installed on site (section 4.2 below).

4.1.3 Australian Standard 2107-2016

AS2107-2016 *"Acoustics – Recommended design sound levels and reverberation times for building interiors"* recommends internal design criteria for occupiable spaces of difference types of development. The design noise levels are determined based on the occupancy type, function/activity of the space within the occupancy and proximity to environmental noise sources.

For residential buildings, the recommended internal design sound levels are based on the location of the proposed development to transportation. This is divided into three categories;

- Houses and apartments in inner city areas of entertainment districts or near major roads.
- Houses and apartments in suburban areas or near minor roads.
- Houses in rural areas with negligible transportation.

For the purpose of this assessment, the following internal design noise level criteria will be adopted;

Table 1 – AS2107 Recommended Internal Design Noise Levels

Type of Occupancy	Space	Time	Internal Traffic Noise Criteria
Houses and apartments in suburban areas or near minor roads	Sleeping Areas (Bedroom)	Night-time only (10pm – 7am)	35 dB(A)$L_{eq(1\ hour)}$
	Living or any other Habitable Areas	24 hours a day	40 dB(A)$L_{eq(1\ hour)}$
Retail	-	When in use	50 dB(A)$L_{eq(15mins)}$

4.2 EXISTING ENVIRONEMNTAL NOISE LEVELS

Measurements of existing noise levels on site was conducted using both long term unattended monitoring and short term attended measurements.

Long term noise monitoring was conducted using an unattended noise monitor installed on site (refer Figure 1), with the mic positioned to have a clear unrestricted view of Bathurst Street. An Acoustic Research Laboratories noise monitor was used for the long term monitoring, set to record continuously on an A-weighted fast response mode. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted. Noise logging was conducted from the 15th May to 21st May 2017.

Unattended noise logging data is attached in Appendix 1 below.

Attended short-term measurements were also conducted by this office, to supplement the long term unattended noise monitoring data. These measurements were conducted on the 15th May 2017 at the following locations around the site;

- Along Bathurst Street, approx. 10m from the curb.
- Along northern boundary of the site – on ground level.
- North-east corner of the site.
- South-east corner of the site.
- Roof of commercial property at 203 Northumberland Street (to measure noise from rooftop mechanical plant).
- Roof of Centrelink property at 211 Northumberland Street (to measure noise from rooftop mechanical plant).

These locations are illustrated in Figure 1 above. Measurements were conducted using a Norsonic type 140 Precision Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted.

Measured noise levels are presented below. In determination of acoustic treatments, the measured levels are adjusted for distance and orientation.

Table 2 – Measured Existing Nosie Levels

Location	Measured Traffic Noise Level dB(A) $L_{eq(1\ hour)}$	
	Daytime (7am-10pm)	Night time (10pm-7am)
Bathurst Street (approx. 10m from curb)	61	60
Northumberland Street (approx. 1m from curb)	58	57

4.3 METHODOLOGY OF EXTERNAL NOISE INTRUSION ASSESSMENT

External noise intrusions will primarily be as a result of noise transfer through the roof, windows and doors, as these are relatively light building elements, which offer less resistance to the transmission of sound. Noise transfer through masonry external walls will not be significant and need not be considered further.

The constructions necessary to attenuate traffic noise impacts to levels complying with those detailed in section 4.1 above, are set out below.

4.3.1 Recommended Treatments

Internal noise levels were calculated based on the expected level and spectral characteristics of the external noise, the area of building elements exposed to the noise source, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

4.3.1.1 Recommended Glazing

Refer to Appendix 2 for a markup of minimum glazing constructions to ensure compliance with the internal noise goals. Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

In addition to meeting the minimum glazing thickness requirements given, the design of the window mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the STC rating of the glazing assembly below the values nominated in the table above. All external windows and doors listed are required to be fitted with Q-lon type acoustic seals. **Note that mohair of fin type seals will not be acceptable for the windows requiring acoustic seals.**

Table 3 – Recommended Glazing

Level	Façade	Space	Recommended Construction	Acoustic Seals
Ground Floor	All	Retail	6.38mm Laminated Glass	Yes
Level 1-3	All	Commercial	6.38mm Laminated Glass or 6mm/12mm airgap/6mm insulated glazed unit	Yes
5-10	All	Bedrooms and Living Rooms	6.38mm Laminated Glass	Yes
11 and above	All	Bedrooms and Living Rooms	6mm	Yes

The window/door suppliers should provide evidence that the systems proposed have been tested in a registered laboratory with the recommended glass thicknesses and comply with the minimum listed STC requirements. Also, the glazing installer should certify that the window/doors have been constructed and installed in a manner equivalent to the tested samples.

Table 5 – Minimum STC/R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum STC/R_w of Installed Window (with acoustic seals)
6mm	29
6.38mm Laminated Glass or 6mm/12mm airgap/6mm insulated glazed unit	31

4.3.1.2 External Doors

Any glass door or glazed panels set into solid doors should be constructed using glazing thickness outlined in the above section. Full perimeter acoustic seals around the doors are required.

Any timber external doors (this includes apartment entry doors along external corridor areas) shall be a minimum 40mm solid core timber with Raven RP10 to the top and sides and Raven RP38 to the underside of the door.

Entry doors to rooms within internal corridor areas shall be of a minimum 35mm solid core timber construct with gaps minimised (maximum undercut of 5mm).

4.3.1.3 External Walls

All external walls are proposed of masonry construct, which are acoustically acceptable and do not require any additional treatments.

There should not be vents on the internal skin of external walls. All penetrations in the internal skin of external walls should be acoustically sealed.

4.3.1.4 Roof / Ceiling

Proposed concrete slab roof is acoustically acceptable and does not require any additional treatments. All opening or penetrations in ceilings must be acoustically sealed.

4.3.2 Ventilation and Air Conditioning

With respect to natural ventilation of dwellings, the NSW Department of Planning document "Development near Busy Roads and Rail Corridors - Interim Guideline" dictates that:

- *"If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), 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."*

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed (i.e. – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in living rooms).

The following areas of the development will be able to achieve the internal noise goals with windows open;

- Living/Dining/Kitchen or habitable non sleeping areas of a Sole Occupancy Units along the eastern façade.

All other areas of the development will require to have their windows closed in order to meet the internal noise goals. A mechanical engineer is to confirm if supplementary ventilation (to meet Australian Standard AS1668.2 requirements) will be required to these rooms.

5 NOISE EMISSION ASSESSMENT

Noise emissions from the subject development should be assessed to ensure that the amenity of nearby land users is not adversely affected.

Potential noise sources which should be assessed are:

- Noise generated by any future mechanical plant and equipment associated with the proposed development.

The potentially nearest affected sensitive receivers are the existing residential properties located to the west of the subject site, across Bathurst Street.

5.1 EXISTING AMBIENT ENVIRONMENT

Existing background noise levels on site were also measured by the unattended noise monitor detailed in section 4.2 above.

The measured background noise levels have been corrected for meteorological conditions (excessive wind and/or rain), as required by section 3.4 of the EPA Industrial Noise Policy. Exceedances of the 5m/s average wind speed limit of the EPA were noted and corrected for in determining the background noise levels. Periods during the long term monitoring affected by adverse weather conditions, have been highlighted in the logging data in Appendix 1.

The measured background noise levels are summarised in the table below.

Table 6 – Measured Rating Background Noise Levels

Location	Rating Background noise level dB(A)$L_{90(period)}$		
	Daytime (7am – 6pm)	**Evening (6pm – 10pm)**	**Night (10pm – 7am)**
64 Bathurst Street, Liverpool	53	51	49

5.2 ASSESSMENT OBJECTIVES

The council DCP does not outline any specific provisions for the control of noise emissions resulting from the proposed development. Hence in the absence of this, noise emissions from the proposed development will be assessed against the provisions of;

- NSW Environmental Protection Authority (EPA) Industrial Noise Policy (INP), and
- NSW EPA Protection of Environmental Operations Regulation 2008.

5.2.1 NSW EPA Industrial Noise Policy

The NSW EPA Industrial Noise Policy, has two criteria which need to be satisfied namely Intrusiveness and Amenity. These are described below:

- *Intrusiveness Criteria* - This guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5 dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

- *Amenity Criteria* - This guideline is intended to limit the absolute noise level from all "industrial" noise sources such as mechanical plant to a level that is consistent with the general environment.

Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor do not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in section 6.1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 7 – Intrusiveness Noise Emission Goals (applicable for surrounding residential properties only)

Location	Period/Time	Intrusiveness Noise Emission Goal dB(A) $L_{eq(15min)}$
Nearby Residences	Day (7am-6pm)	58
	Evening(6pm-10pm)	56
	Night(10pm-7am)	54

Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The NSW EPA Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different areas. They are rural, suburban, urban and urban/industrial interface. This site is categorised by suburban receivers. Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;

- Evening is defined as the period from 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

Table 8 – Amenity Noise Emission Goals

Location	Period/Time	Recommended Acceptable Amenity Noise Emission Goal dB(A) $L_{eq(Period)}$
Nearby Residences – Urban Receiver	Day (7am-6pm)	60
	Evening(6pm-10pm)	50
	Night(10pm-7am)	45
Commercial Premises	When in use	65

5.2.2 NSW EPA Protection of the Environment Operations Regulation 2008

The POEO (Noise Control) Regulation outlines the need to limit the noise levels associated with the operation of domestic air-conditioning units servicing the proposed development. Condition 52 of this act outlines the following;

52 Air Conditioners

(1) A person must not cause or permit an air conditioner to be used on residential premises in such a manner that it emits noise that can be herd within a habitable room in any other residential premises (regardless of whether any door or window to that room is open):

(a) before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or

(b) before 7 am or after 10 pm on any other day.

5.3 COMMENTS/RECOMMENDATIONS

5.3.1 Retail Tenancies

We assume that a DA for use will be lodged for any retail tenancy that will potentially generate significant noise (such as a café with outdoor dining at night time. This would typically include an acoustic report identifying any management controls are necessary to avoid noise impacts (limits in patrons numbers or times of use).

5.3.2 Mechanical Services Noise

Mechanical plant design has not been undertaken at this stage, as plant selections and layout have not been determined. This is typically only done after DA approval. We recommend that a detailed review of all external mechanical plant and equipment should be undertaken at CC stage (once plant selections and locations are finalised), to determine acoustic treatments to control noise emissions to the levels outlined in the table below.

Table 9 – Overall Project Specific Noise Emission Objectives

Type of Receiver	Time of day	NSW INP Amenity Criteria dB(A) $L_{eq(period)}$	NSW INP Intrusiveness Criteria and Council DCP Requirements (*background + 5*) dB(A) $L_{eq(15minutes)}$	NSW EPA POEO Criteria for Residential Condensers
Residential	Day	60	58	N/A
	Evening	50	56	N/A
	Night	45	54	Inaudible within neighbouring premises
Commercial	When in use	65	N/A	N/A
Industrial	When in use	70	N/A	N/A

All plant can be satisfactorily attenuated to levels complying with the noise emission criteria above, through appropriate plant selection and location and, if necessary, standard acoustic treatments such as noise screens, enclosures and in-duct treatments (silencers/lined ducting).

6 CONSTRUCTION NOISE AND VIBRATION

Noise from construction shall be managed in accordance with the EPA Interim Construction Noise Guideline and Australian Standard AS2436.

Construction vibration shall be managed in accordance with the EPA Assessing Vibration: A Technical Guideline and DIN4150-3.

6.1 EPA CONSTRUCTION NOISE GUIDELINE

The EPA Interim Construction Noise Guideline (ICNG) assessment requires:

- Determination of noise generation goals (based on ambient noise monitoring).
- Review of operational noise levels at nearby development.
- If necessary, recommendation of noise controls strategies in the event that compliance with noise emission goals is not possible.

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *"Noise affected" level*. Where construction noise is predicted to exceed the "noise effected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise effected level". For residential properties, the "noise effected" level occurs when construction noise exceeds ambient levels by more than 10dB(A)$L_{eq(15min)}$.
- "*Highly noise affected level".* Where noise emissions are such that nearby properties are "highly noise effected", noise controls such as respite periods should be considered. For residential properties, the "highly noise effected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

In addition to the above goals for residential receivers, the ICNG nominates a Management Level of 45dB(A) $L_{eq(15min)}$ internally for School Classrooms and 70dB(A) $L_{eq(15min)}$ at commercial receptor facades (typical office, retail).

A summary is presented below.

Table 10 – Noise Management Levels - residential

Location	"Noise Affected" Level - dB(A)$L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$
Residential Receivers	63	75
Commercial Receivers	70	

Based on these criteria the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction activities at the sensitive receivers.
- If noise levels exceed “background + 5 or 10 dB(A)” noise goal at residential receiver locations, investigate and implement all practical and cost effective techniques to limit noise emissions.
- For the school receivers, a 45dB(A)$L_{eq\ (15min)}$ *internal* criterion has been adopted at all times, in accordance with the EPA Interim Construction Noise Guideline.
- For the commercial receivers, a 70dB(A)$L_{eq\ (15min)}$ criterion has been adopted at all times, in accordance with the EPA Interim Construction Noise Guideline.
- If the noise goal is still exceeded after applying all practical engineering controls to limit noise emissions investigate management and other techniques to mitigate noise emissions.

6.2 AS2436

Section 3 of AS 2436 states that care shall be taken in applying criteria that normally would be used to regulate noise emitted from industrial, commercial and residential premises to construction, particularly for those activities which are transitory and of short duration. For the control and regulation of noise from construction sites AS2436 nominates the following:

- That reasonable suitable noise criterion is established.
- That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours.
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

6.3 VIBRATION

Vibration caused by construction at any residence or structure outside the subject site must be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*

- For human exposure to vibration, the evaluation criteria presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment

The criteria and the application of this standard are discussed in separate sections below.

6.3.1 Structure Borne Vibrations

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 4.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 12 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			**Plane of Floor of Uppermost Storey**
		< 10Hz	**10Hz to 50Hz**	**50Hz to 100Hz**	**All Frequencies**
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

6.3.2 Assessing Amenity

Department of Environment and Conservation NSW "*Assessing Vibration: A Technical Guideline*" (Feb 2006) is based on the guidelines contained in BS 6472:1992. This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings.

6.4 DISCUSSION

A detailed construction noise and vibration management plan is not typically conducted at development approval stage, as demolition and construction methods (or a construction contractor) are not known.

However:

- Primary construction noise and vibration activities will be during demolition and basement excavation.

- In this case, given the limited extent of demolition, it will be basement excavation using pneumatic hammer that will be the most noise and vibration intensive activity. Intermittent exceedances of the criteria outlined in section 6.2 are likely.

- Minimising use of pneumatic hammers (and using excavator with bucket or rock rippers as much as practicable) is recommended.

- Use of concrete pumps will also have a risk of noise impact, however are not typically conducted every day (just on days of concrete pours).

In light of the above, we recommend:

- In the event of extensive excavation requiring hydraulic hammer, sheet piling or extensive ground compaction using vibratory roller, vibration monitoring should be conducted at the adjacent commercial buildings. Any monitoring system should have SMS vibration warning notification capability.

- Excavation using excavator with bucket and rock ripper as much as practicable (minimising use o hydraulic hammers).

- Piling done by pored piles (as opposed to driven or vibrated) if feasiable.

- Use of electric crane (as opposed to diesel) if feasible.

- If concrete trucks must be parked on Bathurst Street on days of concrete pours, adjacent residences should be notified beforehand

- If concrete pumping stations can be located within the site (away from the Bathurst Street residences), this should also be adopted. If feasible, located any fixed concrete pump away from the Bathurst Street residences.

The above recommendations should be incorporated in the Construction Noise and Vibration Management Plan. This should be developed prior to CC, once a construction contractor is appointed.

7 CONCLUSION

Potential noise impacts associated with the proposed mixed-use development at 64 Bathurst, Liverpool have been assessed.

Noise impacts from environmental noise sources (traffic) on future occupants of the development, have been assessed in accordance with the requirements of:

- The Liverpool DCP 2008,
- All relevant Australian Standards and
- The NSW Department of Planning SEPP Infrastructure (2007) guideline.

The acoustic treatments necessary to achieve compliance with the acoustic requirements contained within these guidelines have been set out in section 4.3.1.

Noise emissions objectives for the site have also been determined, based on on-site noise logging and noise emission guidelines typically adopted by council and contained in the NSW EPA Industrial Noise Policy. This is outlined in section 5 above.

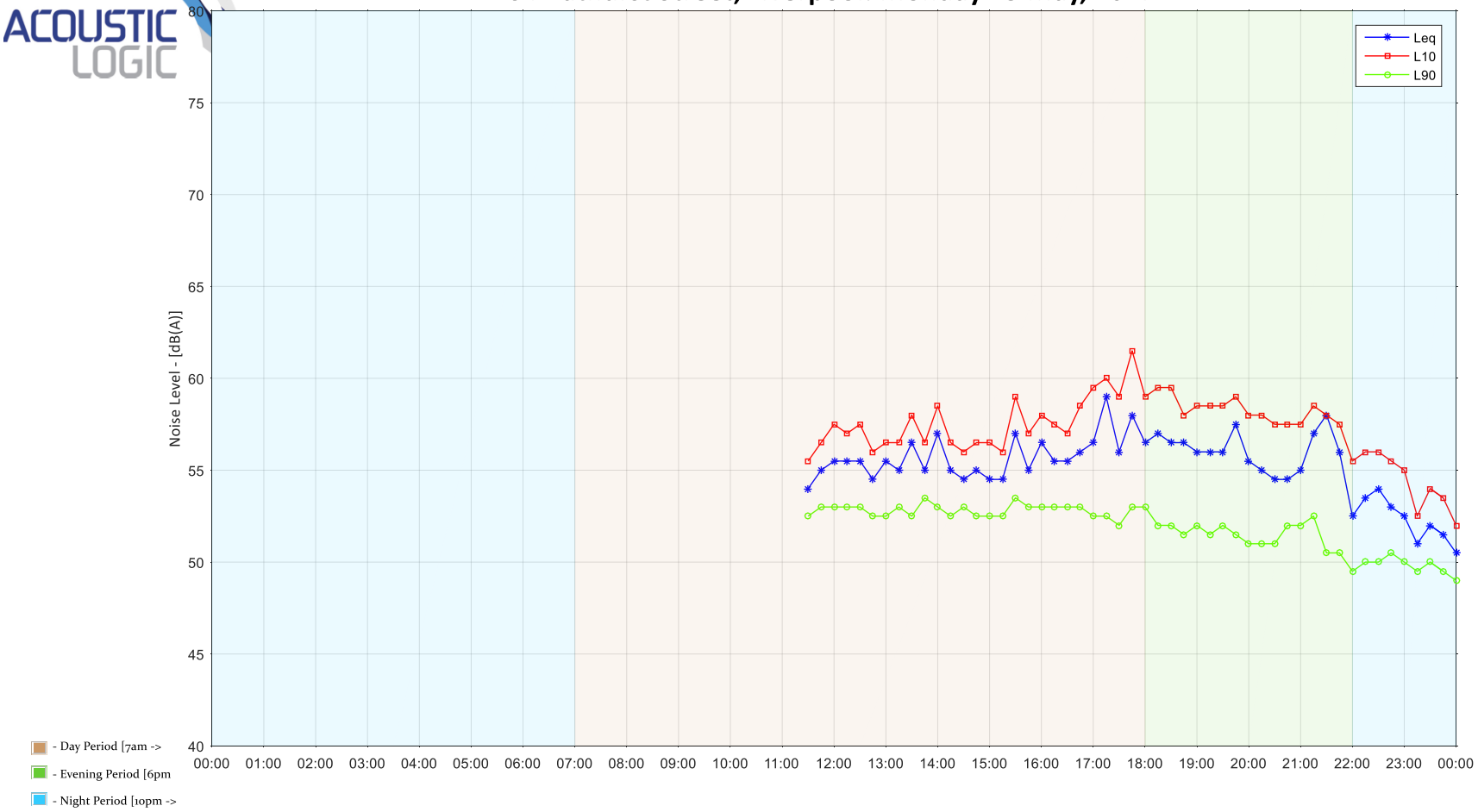
We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

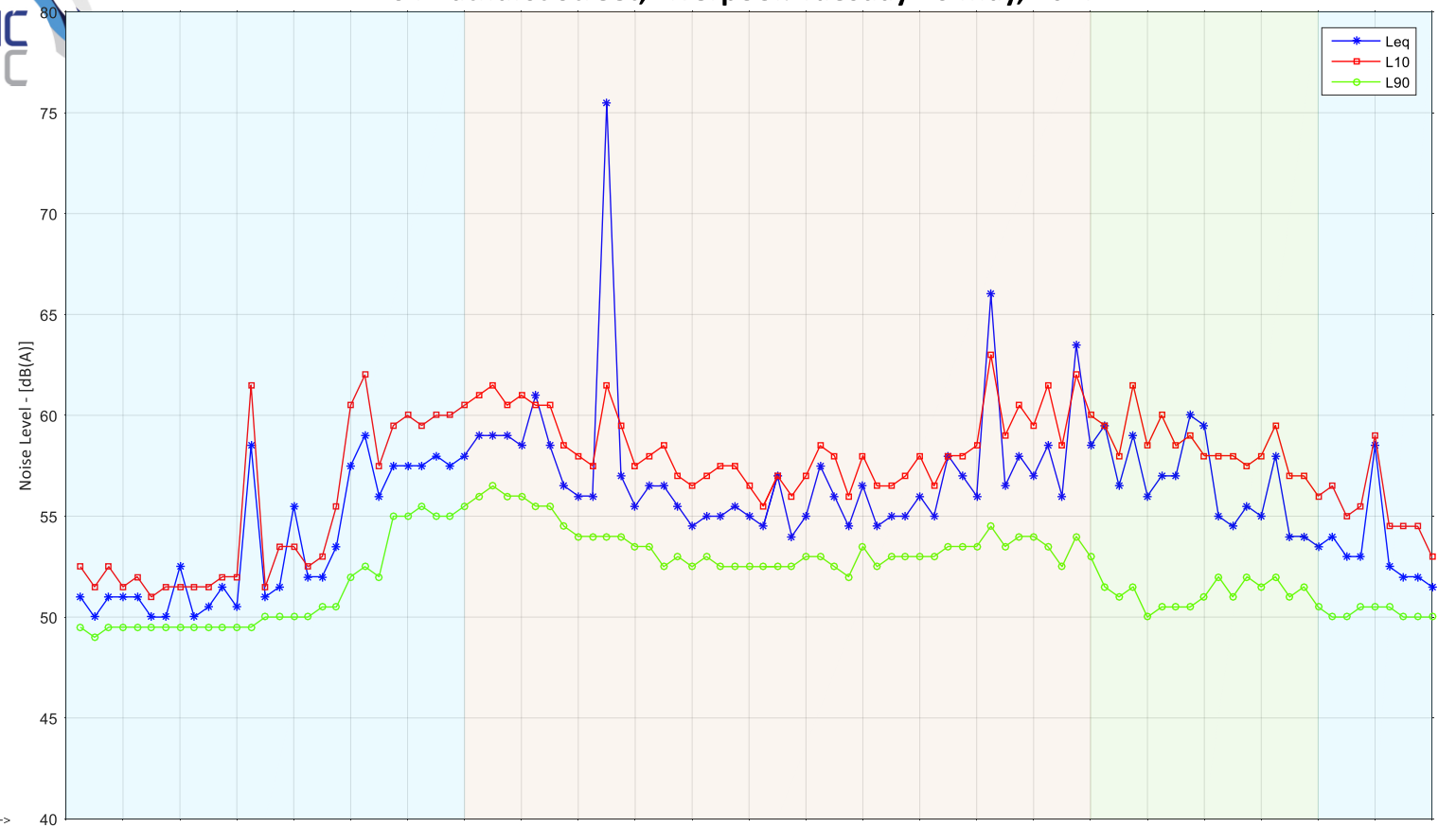
Acoustic Logic Consultancy Pty Ltd
Thomas Taylor

APPENDIX 1 – UNATTENDED NOISE MONITORING DATA

64 Bathurst Street, Liverpool: Monday 15 May, 2017

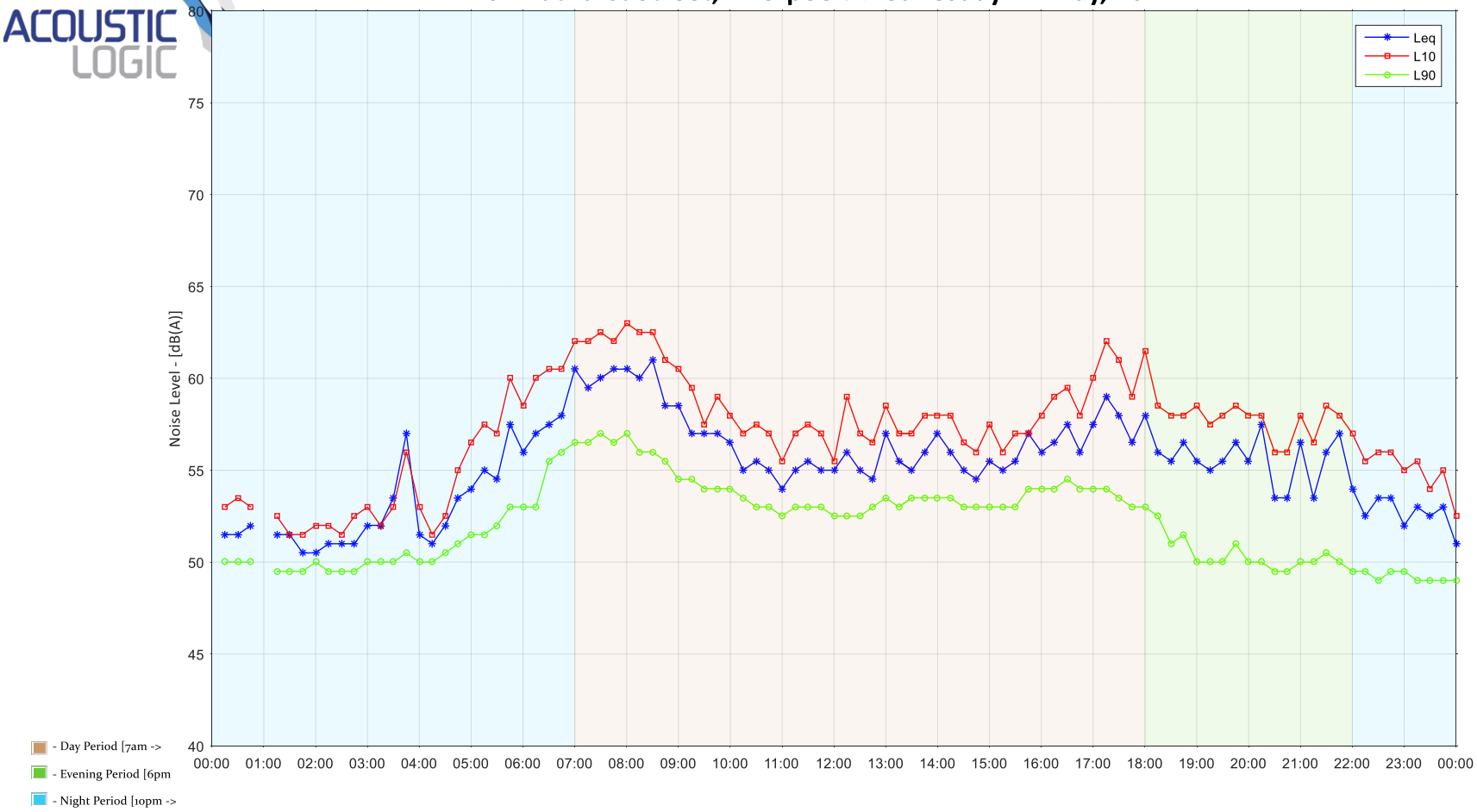


64 Bathurst Street, Liverpool: Tuesday 16 May, 2017

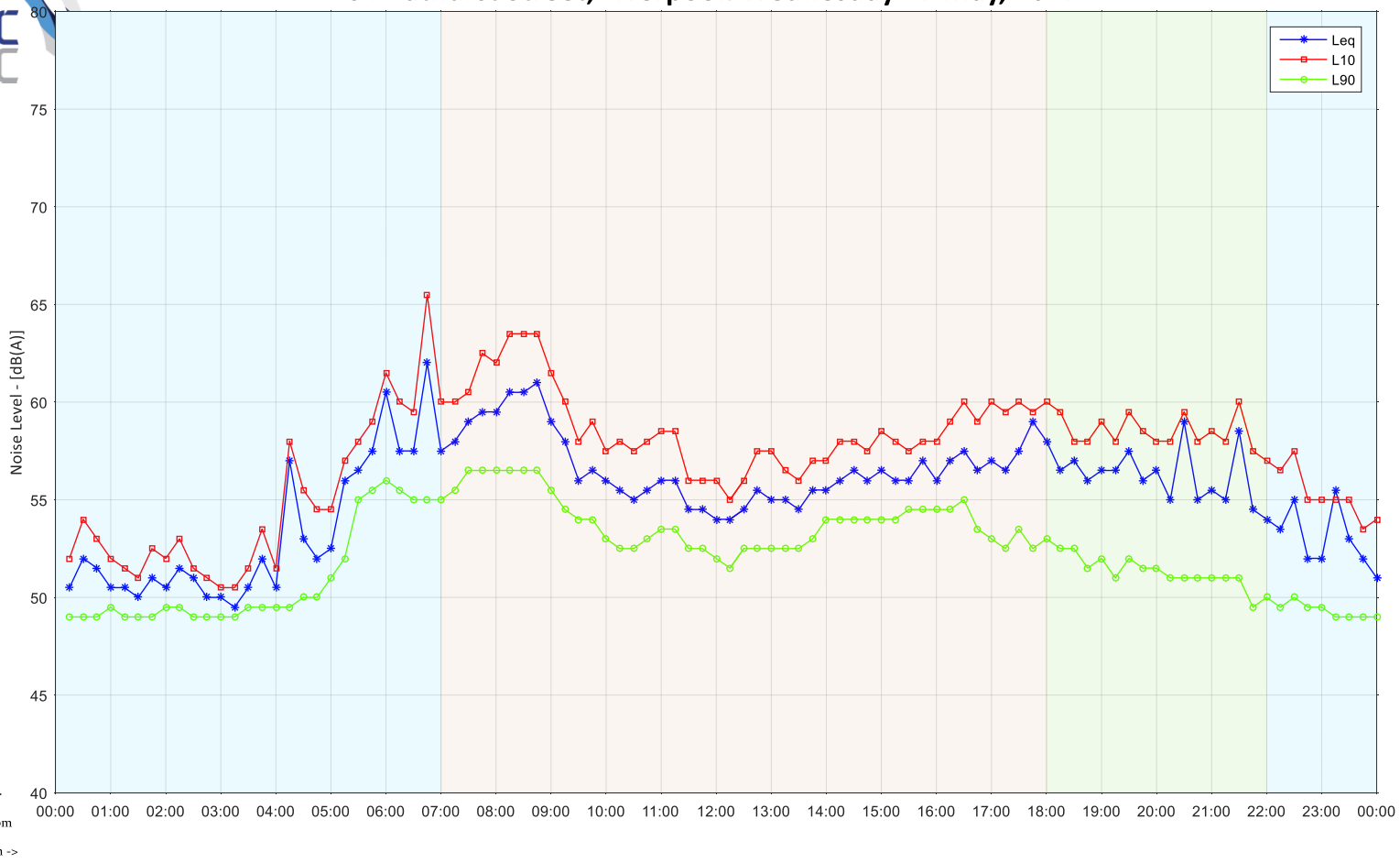


- Day Period [7am ->
- Evening Period [6pm
- Night Period [10pm ->

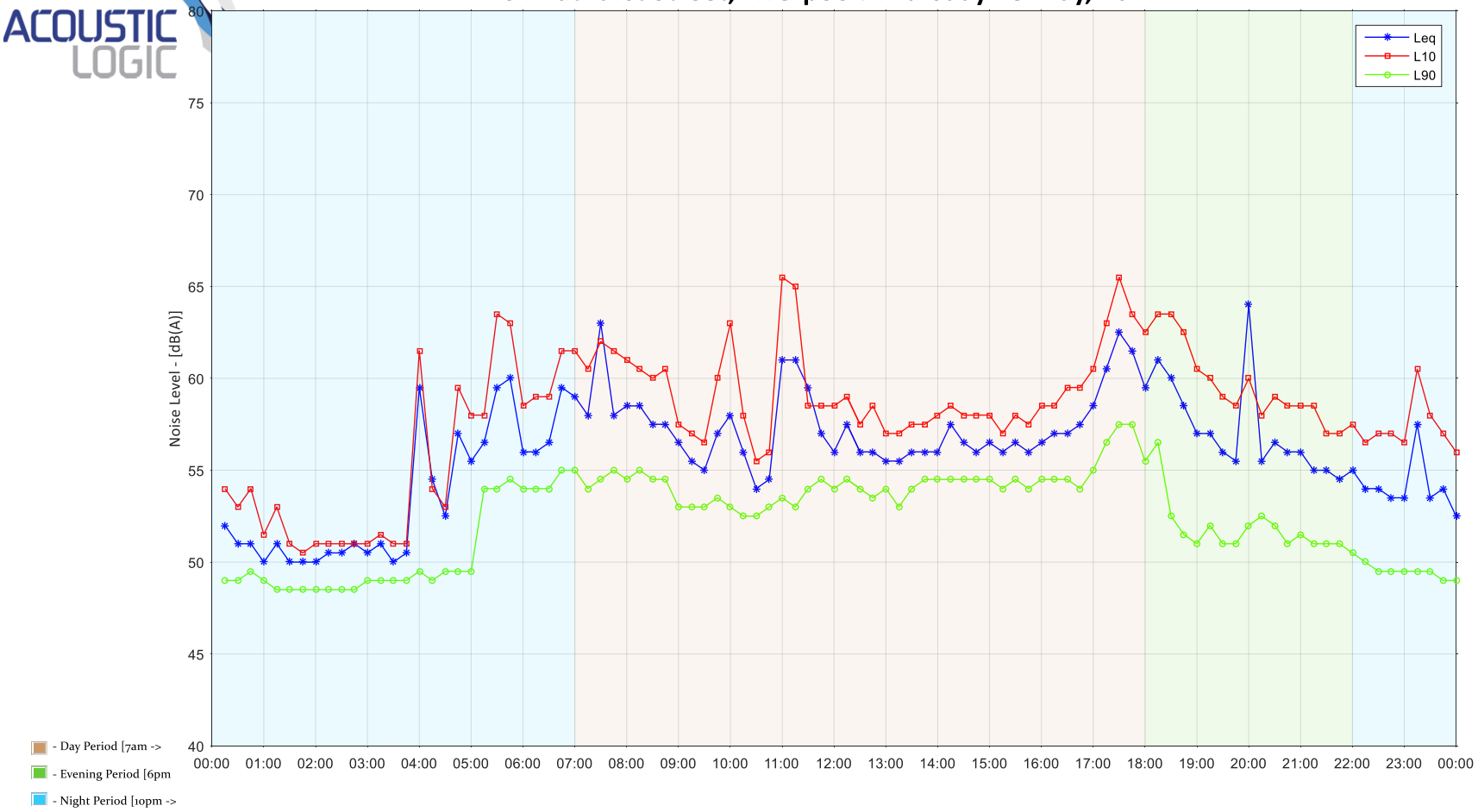
64 Bathurst Street, Liverpool: Wednesday 17 May, 2017



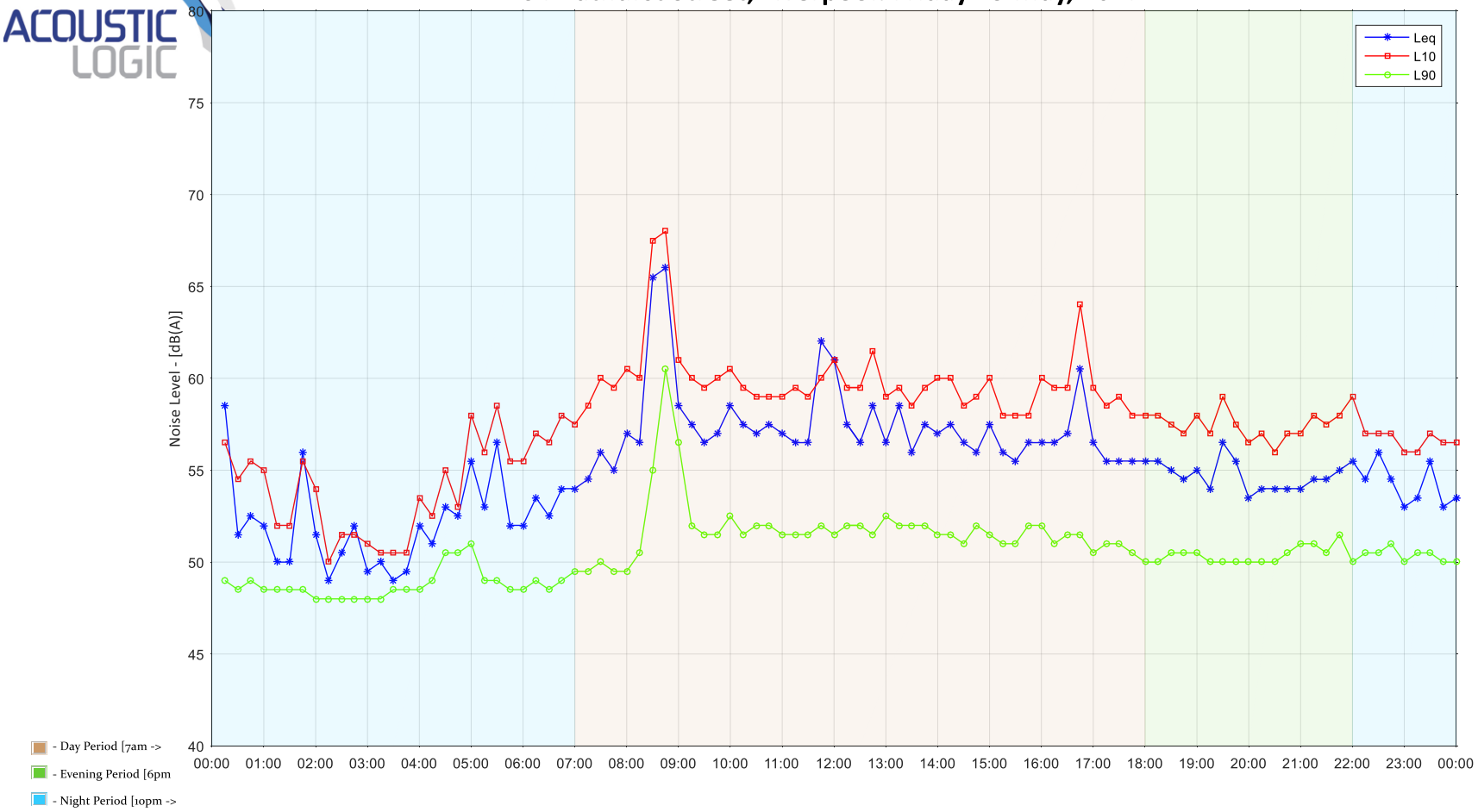
64 Bathurst Street, Liverpool: Wednesday 17 May, 2017



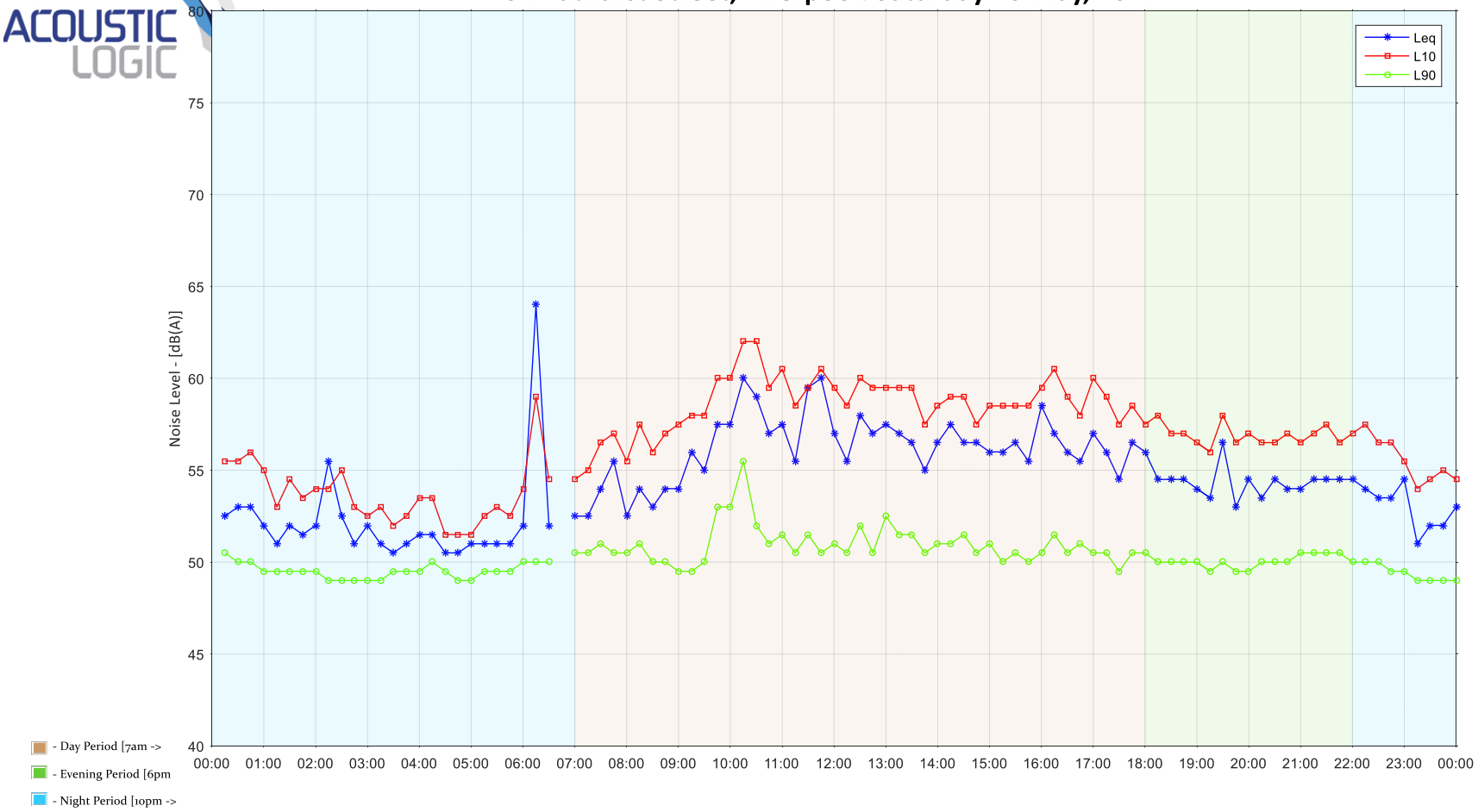
64 Bathurst Street, Liverpool: Thursday 18 May, 2017



64 Bathurst Street, Liverpool: Friday 19 May, 2017



64 Bathurst Street, Liverpool: Saturday 20 May, 2017



64 Bathurst Street, Liverpool: Sunday 21 May, 2017