ACOUSTICS AND AIR

NORTHSIDE CLINIC, ST LEONARDS DEVELOPMENT APPLICATION

NOISE IMPACT ASSESSMENT

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PREPARED FOR

AKALAN PROJECTS
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DOCUMENT CONTROL

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

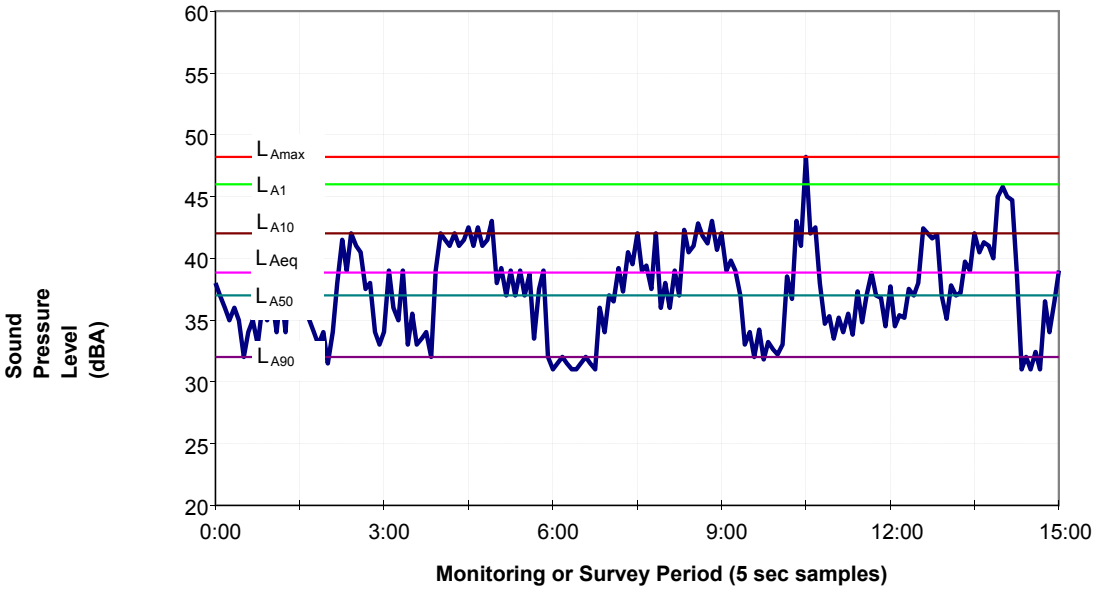
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Wilkinson Murray Pty Limited (WMPL) has been engaged by Akalan Projects Pty Ltd (Akalan) to conduct a noise impact assessment of a proposed 8-storey mental health hospital and consulting room development. The hospital is to be constructed at 10 Herbert Street, St Leonards and operated by Ramsay Health Care. The assessment is required to accompany the Development Application (DA) submission to Willoughby City Council.

This report considers the following noise related impacts potentially generated by the development that may affect the surrounding receivers:

- Externally located mechanical plant.
- Additional road traffic noise.

In addition, the following noise related issues are considered that potentially may affect the development itself:

- Externally located mechanical plant or industrial / commercial processes at surrounding sites.
- Road traffic noise.

The noise impacts will be assessed according to guidelines promulgated by the NSW Environment Protection Authority (EPA):

- *Noise Guide for Local Government (NGLG).*
- *Industrial Noise Policy (INP) + Application Notes (December 2010).*
- *Road Noise Policy* (*RNP*).

In addition to the above guidelines, reference has been made to:

- *Willoughby Development Control Plan 2006 (WDCP 2006) – Part F.*
- Australian Standard and New Zealand Standard 2107–2000, *Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors (AS/NZS 2107).*

2 PROPOSED DEVELOPMENT

2.1 Project Site

The proposed development site is located at 10 Herbert Street, St Leonards with vehicular access via Frederick Street only.

As determined from a site visit, the immediate surrounding development includes light industrial, commercial, warehouses, shopping centres and the like. These are shown in Figure 2-1. All nearby buildings are low level (single to three levels typically) compared to the 8-storey development proposed.

The noise environment of the development site and surrounding area is mainly influenced by noise from road traffic. Reserve Road would be considered a sub-arterial road that directly leads to the Gore Hill Freeway (arterial road) and indirectly leads to Pacific Highway (arterial road) through various streets via another light industrial/business area. Herbert Street would also be considered a sub-arterial road that directly leads to the Pacific Highway. Residential receivers are located along this road near the intersection of Westbourne Street. They are multi-storey and at a distance of approximately 300m from the proposed rooftop mechanical plant location for the hospital.

Frederick Street connects the site to both Reserve Road and Herbert Street.

The ambient noise in the area is also, at times, influenced to a lesser degree by activities associated with the nearby developments, such as mechanical plant.

Figure 2-1 Project Location

Aerial image courtesy of © 2015 nearmap ltd

2.2 Project Description

An 8-storey hospital is proposed following the demolition of the two existing warehouse buildings currently occupying the site. The building will be fully air-conditioned with no operable external glazing.

There will be approximately 30 consulting rooms and 170 patient rooms together with kitchen and other recreational facilities.

The consulting rooms will be located on the Ground, First and Second Floors, with the Fourth to Seventh Floors located patient rooms.

Vehicular access to the hospital will be from Frederick Street, and 139 on-site parking spaces plus 6 short-term drop off spaces are proposed. These will be located on the Ground and First Floors.

The main plant room is to be located on the Roof Level where a platform will locate condensers and a chiller. The kitchen exhaust fan will also exhaust to the roof. The other major plant item will be a carpark exhaust located in a plant room on Level 6, drawing air from the two carparks and exhausting via grilles on Level 7.

Typical hospital operational hours are envisaged whereby the patient rooms are 24/7, whereas the consulting rooms and most of the recreational facilities are operated during the daytime period only.

2.3 Noise Impacts to be considered by this Assessment

The most sensitive potentially-affected receivers are residences located along Herbert Street, approximately 300m away. Considering that Herbert Street would be classified under the *Road Noise Policy* as a sub-arterial road, the additional movements generated by the proposed hospital would lead to negligible noise impact at these receivers. Other potentially-affected receivers are commercial or light industrial in nature, and given the significantly higher criteria for such receivers under the *Road Noise Policy*, the impact of traffic associated with the proposed development would also be negligible for these receivers.

On this basis, it is not necessary to assess in detail the noise impact of additional traffic on the road network associated with the operation of the hospital.

This report will therefore focus on controlling noise from the surrounding area (road traffic and industry) to internal spaces of the proposed hospital, as well as the impact of mechanical plant noise from the development to surrounding receivers (including residential located approximately 300m away).

3 EXISTING NOISE ENVIRONMENT

3.1 Methodology

In order to characterise the existing acoustical environment in the area, ambient noise monitoring was carried out from Tuesday, 1 December 2015 to Wednesday, 9 December 2015.

Considering the site and security of the instrumentation, two locations were selected (refer to Figure 3-1).

- Noise Monitoring Location 1 (NM1) is located on the boundary of the site and TradeLink and has a direct view to Frederick Street and the associated traffic and low level industrial noise associated with Kennards Storage and Homemaker Centre. This is representative of the worst-case façade of the proposed hospital.
- Noise Monitoring Location 2 (NM2) is located just inside the site opposite Tesla and across from SBS. This location is partially shielded from traffic noise and is representative of the quieter façade facing the Technopark. It also conservatively represents existing noise conditions to the residential receivers along Herbert Street; that is, the measured levels will, if anything, be lower than actual levels at the residences.

Figure 3-1 Location of Noise Loggers

Aerial image courtesy of © 2015 nearmap ltd

Noise level measurements were conducted using the following equipment:

- Environmental Noise Logger ARL 215 and ARL 316; and
- Bruel & Kjaer 4231 Acoustic Calibrator.

Loggers were set to A-weighted and fast response.

The loggers continuously sampled noise levels over the entire survey period, and calculated relevant statistical indices for each 15-minute interval. Data measured during periods of adverse weather, established through consultation with historical weather reports provided by the Bureau of Meteorology (BOM), has been excluded.

These instruments have recent calibration certificates traceable to a NATA certified laboratory. Furthermore, the equipment calibration was checked before and after the survey and no significant drift was noted.

All measurements were undertaken in general accordance with AS 1055:1997: *Acoustics – Description and Measurement of Environmental Noise* and the *INP*.

3.2 Noise Monitoring Results

The results of the unattended noise logging have been processed considering the *Industrial Noise Policy* (*INP*) for day, evening and night periods to derive the RBL and the *RNP*, and in order to assess glazing to minimise noise ingress.

A summary of the relevant parameters from the unattended monitoring is provided in Table 3-1 and Table 3-2.

Table 3-1 Summary of Unattended Noise Monitoring – RBL

Noise Monitoring Location	Day 7am – 6pm	Evening 6pm – 10pm	Night 10pm – 7am
NM1	58	56	57 (56)
NM2	50	42	40

Note: As per the application notes (INP), it is not expected that the night time RBL will be a higher value than that of the evening. In this case, the level measured during the evening is also assumed to represent the night.

Table 3-2 Summary of Unattended Noise Monitoring – L_{Aeq}

Noise Monitoring Location	Day 7am – 10pm	Night 10pm – 7am
NM1	64	62
NM2	57	53

Daily noise monitoring plots are available upon request

4 ASSESSMENT CRITERIA

4.1 Willoughby City Council

Part F of Willoughby City Council's Development Control Plan 2006 (WDCP 2006) does not provide numeric values to control noise ingress. It does however provide generic guidance in controlling noise through appropriate building design and site management.

In the professional opinion of Wilkinson Murray Pty Ltd, noise ingress should be designed to meet the requirements of AS/NZS 2107–2000 as set out in Section 4.2 of this report. Control of external noise from mechanical plant should be in accordance with *INP* and *NGLG* as set out in Section 0 of this report.

4.2 Australian Standard & New Zealand Standard

Australian and New Zealand Standard AS/NZS 2107–2000, *Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors* recommends design sound levels for different areas of occupancy inside various spaces. With reference to AS/NZS 2107, the most relevant criteria for this project are those associated with Health Buildings.

Table 4-1 summarises both the satisfactory and maximum criteria for the more critical types of occupancy relevant for this project.

Table 4-1 Recommended Design Sound Levels for Different Areas of Occupancy in Health Buildings (AS/NZS 2107–2000)

Type of Occupancy / Activity	Recommended Design Sound Level, L_{Aeq} (dBA)	
	Satisfactory	Maximum
Wards	35	40
Office Areas	40	45
Consultant Rooms	40	45
Waiting Rooms	40	50
Receptions	45	50
Kitchens	45	50

4.3 *Industrial Noise Policy* & *Noise Guide for Local Government*

The *INP*, while specifically aimed at large and complex industrial activities, defines a number of terms such as 'intrusiveness' and can be used to provide guidance to councils on assessing and measuring noise.

To assist councils in assessing smaller commercial activities the *NGLG* is typically used. Within this document, local councils are encouraged to develop noise policies which specify intrusive noise goals using appropriate noise level descriptors.

This assessment primarily relies on the information and guidance within the *NGLG* for residential receivers whereas the *INP* is relied on for the nearby commercial and industrial receivers. Given the uniqueness of the locality having both commercial and industrial receivers, the more conservative goal associated with commercial receivers has been used in this assessment.

4.3.1 Noise Goals Associated with Continuous or Semi-Continuous Events – Residential

The *NGLG* suggests that Councils develop a goal that limits the permissible level of noise from a site to no more than the background noise plus 5dBA when measured over a typical 15-minute period during the day, evening or night time periods. These standard time periods are defined in the previous section of this report. This is typically shown as:

$$L_{Aeq,15\ min} \leq RBL + 5$$

4.3.2 Noise Goals Associated with Continuous or Semi-Continuous Events – Commercial

Using the *INP*, the amenity goals for commercial receivers is typically shown as:

$$L_{Aeq,period}$$ 65 (acceptable) to 70 (maximum)

These goals are applied when the commercial receiver is in use.

4.4 Project-Specific Noise Goals

Following a review of the applicable guidelines, the section below is a summary of the project specific noise goals for this project:

4.4.1 Internal Noise Design Goals for Road Traffic and Industry Intrusion

This is based on AS/NZS 2107 and considers that the internal space will be conditioned so an allowance for mechanical plant noise is made.

Table 4-2 Recommended Internal Design Sound Levels

Type of Occupancy / Activity	Recommended Design Sound Level L_{Aeq} (dBA)
Wards	37
Office Areas	42
Consultant Rooms	42
Waiting Rooms	47
Receptions	47
Kitchens	47

4.4.2 External Noise Goals for Mechanical Plant

This is based on the *NCLG* and *INP* for both the nearby receivers (conservatively considered to be commercial) and the nearest residential receivers located some 300m away.

Table 4-3 Recommended External Noise Goals

Receiver	Recommended Design Sound Level L_{Aeq} (dBA)
Commercial	
When in Use	65
Residential	
Day	55
Evening	47
Night	45

5 ACOUSTICAL ASSESSMENT & DESIGN RECOMMENDATIONS

5.1 Road Traffic Noise Intrusion

The façade facing Frederick Street is confirmed to be the most impacted by traffic and industry.

The final construction detail for the glazing (in particular) and the façade and roof is to be confirmed at Construction Certificate stage; however, the following section provides an assessment to confirm the likely constructions.

Glazing

Along this façade, on Ground to Level 3 inclusive, consultant rooms are located. These rooms will be typically used during the day (and possibly early evening) period and, as such, a façade level of $L_{Aeq\ (15hr)}$ 68dBA is applicable for glazing design. The results of measurements presented in Table 3-2 have been adjusted (increased) by 4dB to account for the angle of view and distance.

In providing a typical glazing to meet the recommended internal noise level, the following information from the drawings and our assumptions is relevant:

- Room size 4.3m x 3.7m x 2.7m height (typical from drawings).
- Fixed glazing of at least 20% of floor area (assumed as typical).
- Furnished office with medium level absorption – at least carpet (assumed as typical).
- Internal design level of L_{Aeq} 42dBA.

On the basis of the above, the minimum glazing for acoustic purposes shall be:

- 5mm thick glazing in a standard frame with acoustic seals.
- Minimum acoustic rating of the system R_W 28.

Wards are located along the same façade and begin on Level 4. The façade level applicable for glazing design is $L_{Aeq\ (15hr)}$ 66dBA.

In providing a typical glazing to meet the recommended internal noise level, the following information from the drawings and our assumptions is relevant:

- Room size 4.9m x 3.6m x 2.7m height (typical from drawings).
- Fixed glazing of at least 20% of floor area (assumed as typical).
- Furnished office with low-medium level absorption (assumed as typical).
- Internal design level of L_{Aeq} 37dBA.

On the basis of the above, the minimum glazing for acoustic purposes shall be:

- 6mm thick glazing in a standard frame with acoustic seals.
- Minimum acoustic rating of the system R_W 30.

It can be seen from these indicative predictions, that onerous glazing is not required to meet appropriate internal goals and control external noise. It is likely that the final glazing will be dictated by structural or thermal requirements and, as such, a review is recommended to confirm that the final glazing will also meet the internal noise requirements as per this report.

Facade

The proposed external wall construction is likely to incorporate a fibre cement (or similar) cladding and be acceptable in terms of sound insulation.

Roof / Ceiling

The proposed roof construction is likely to incorporate a metal deck and be acceptable in terms of sound insulation.

5.2 Mechanical Plant Noise Emissions

The potential for noise impacts from the proposed hospital development, once occupied, on the surrounding community and the development itself could arise from the following:

- Exhaust Fans located on the roof.
- Carpark Exhaust Fan located on Level 6.
- Hospital Air-Conditioning systems and Chiller located on the roof.

The mechanical plant design is still preliminary; however, the information from DSA Consulting (provided to WMPL via email on 15 December 2015) is sufficient to predict the noise impact to nearby receivers.

In summary, a rooftop plant area will locate:

- 25x Air-Conditioning Condenser Units and 1x Air Cooled Chiller — Total SWL 90dBA
- 1x Kitchen Exhaust Fan — Total SWL 95dBA
- 2x Stair Pressurisation Fans — Total SWL 95dBA

The carpark exhaust fan will be located within a plant room on Level 6.

A preliminary noise assessment of the plant considering an unlikely case where all roof plant would be running at full capacity has been undertaken.

On this basis, the noise level at the nearest residential receivers, assuming direct line of sight, would be less than 40dBA, and in compliance with even the night time intrusive noise goal of 45dBA for this project.

The nearest and most impacted commercial receiver would be a nearby 3-storey building. The distance and shielding from the roof plant on the proposed 8-storey building would be more than sufficient to meet the amenity goal of 65dBA for commercial receivers. In the event that the adjacent buildings are replaced with commercial buildings of similar height to the proposed hospital, the relevant noise criterion would be met with the application of simple controls that could be implemented either on the hospital site or on the new development.

It is assumed that the carpark ventilation system will allow for inlet and outlet attenuators if required, and probably incorporate a timer / carbon monoxide sensor to minimise the operation of the system.

Despite the above, the mechanical plant associated with the development should be reviewed by an appropriately qualified acoustic consultant at the construction certificate / detailed design stage when final plant selections have been made and final layout and operation confirmed. The noise goals as per this report are to be met for day, evening and night operations.

6 CONCLUSION

Wilkinson Murray Pty Limited has been engaged by Akalan Projects Pty Ltd to conduct a noise impact assessment of a proposed 8-storey mental health hospital and consulting room development. The hospital is to be constructed at 10 Herbert Street, St Leonards, within essentially an industrial area with both industrial and commercial receivers. The nearest residential receivers are located 300m from the development.

Once completed the hospital will be operated by Ramsay Health Care.

This assessment is required to accompany the Development Application submission to Willoughby City Council and has focussed on potential noise intrusion from road traffic and industry as well as operational noise emissions (mechanical) from the hospital.

The assessment involved a survey of the existing noise environment, derivation and establishment of assessment criteria for noise intrusion and emissions in accordance with relevant guidelines, a noise impact assessment relative to appropriate criteria, and, where required, recommendations for in-principle noise control measures.

The findings are as follows:

Noise Intrusion from Road Traffic & Industry

The building envelope of the proposed hospital can be designed to satisfy the project-specific goals relating to internal noise goals from external sources.

The weakest path will be glazing; however, predictions confirm that onerous glazing is not required to meet appropriate internal goals. It is likely that the final glazing will be dictated by structural or thermal requirements and, as such, a review is recommended at the Construction Certificate / Detailed Design stage to confirm that the final glazing will also meet the internal noise requirements as per this report.

Mechanical Noise Emissions

The mechanical services design as reviewed can be designed to satisfy the project-specific goals relating to external noise to existing commercial buildings and residential buildings. In the event that the adjacent buildings are replaced with commercial building of similar height to the proposed hospital, the relevant noise criterion could be met (if required) with simple controls that could be implemented either on the hospital site or on the new development.

Despite the above, the mechanical plant associated with the development should be reviewed by an appropriately qualified acoustic consultant at the Construction Certificate / Detailed Design stage, when final plant selections have been made and final layout and operation confirmed. The noise goals as per this report are to be met for day, evening and night operations.