

KNOWLES GROUP

# 25-27 WARRIEWOOD ROAD, WARRIEWOOD NOISE IMPACT ASSESSMENT

AUGUST 2017



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## 25-27 Warriewood Road, Warriewood Noise impact assessment

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# TABLE OF CONTENTS

	EXECUTIVE SUMMARY .....	ii
1	INTRODUCTION .....	1
1	NOISE SURVEY .....	3
1.1	Site conditions and measurement location .....	3
1.2	Methodology and equipment .....	4
1.3	Results .....	4
2	ASSESSMENT CRITERIA.....	5
2.1	Noise egress.....	5
2.1.1	NSW INP criteria.....	5
2.1.2	Project specific criteria.....	6
2.1.3	Road traffic noise.....	7
2.2	Noise ingress .....	7
2.2.1	Internal sound insulation criteria .....	8
2.2.2	Sleep disturbance criteria.....	9
3	ASSESSMENT .....	10
3.1	Plant noise emissions .....	10
3.2	Traffic noise generation.....	10
3.2.1	Operational traffic noise .....	10
3.2.2	Road traffic noise.....	11
3.2.3	Construction traffic noise .....	11
3.3	Noise ingress .....	11
3.4	Internal sound insulation.....	12
4	CONSTRUCTION NOISE AND VIBRATION.....	13
5	CONCLUSION.....	14

# EXECUTIVE SUMMARY

WSP was appointed to provide a Noise Impact Assessment for a development site at 23-27 Warriewood Road, Warriewood NSW. The site will consist of the approved Arcare Warriewood aged care facility at 23 Warriewood Road, and a proposed residential development to be located at 25-27 Warriewood Road.

Environmental noise surveys identified that road traffic was the most significant noise sources observed at site. Noise from the nearby childcare facility on 26 Hill Street was briefly audible in the absence of traffic but did not make a noticeable contribution to measured levels. Construction work to the north of the site did not influence measured background noise levels, and works on Macpherson Street were inaudible.

The noise emission limits (from mechanical services, plant noise, on site traffic and car-parking) at noise sensitive receivers, have been determined by the measured background noise levels and are as follows:

$$\begin{aligned}\text{Day} &\leq 50 \text{ dBA } L_{\text{eq},15\text{min}} \\ \text{Evening} &\leq 42 \text{ dBA } L_{\text{eq},15\text{min}} \\ \text{Night} &\leq 39 \text{ dBA } L_{\text{eq},15\text{min}}\end{aligned}$$

Noise levels emitted from these sources associated with the development will be controlled to within these limits using suitable mitigation measures such as; placement away from receivers, noise barriers, acoustic louvres, acoustic absorption, attenuators, and double skinned equipment casings.

On site deliveries and waste removal will take place within an enclosed carpark located on the lower ground floor. As such, noise generated during these activities is not expected to be of concern at surrounding residences.

Traffic noise levels on Warriewood Road are not expected to significantly increase as a result of the development and is expected to comply with the Road Noise Policy criteria.

Noise ingress to the aged care facility and residential development is expected to meet the relevant internal ambient noise level requirements and sleep disturbance criteria. The assessment indicated a façade glazing performance of 32 dB  $R_w + C_{tr}$  would be required to meet internal noise levels for townhouses facing Warriewood Road.

Internal noise transfer between apartments that are vertically or horizontally adjacent shall be controlled in line with legislative criteria set out in the National Construction Code, Volume One Part F5 and Volume Two Section 3.8.6.

It is recommended that any potential construction noise impacts are managed in accordance with the relevant guidelines.

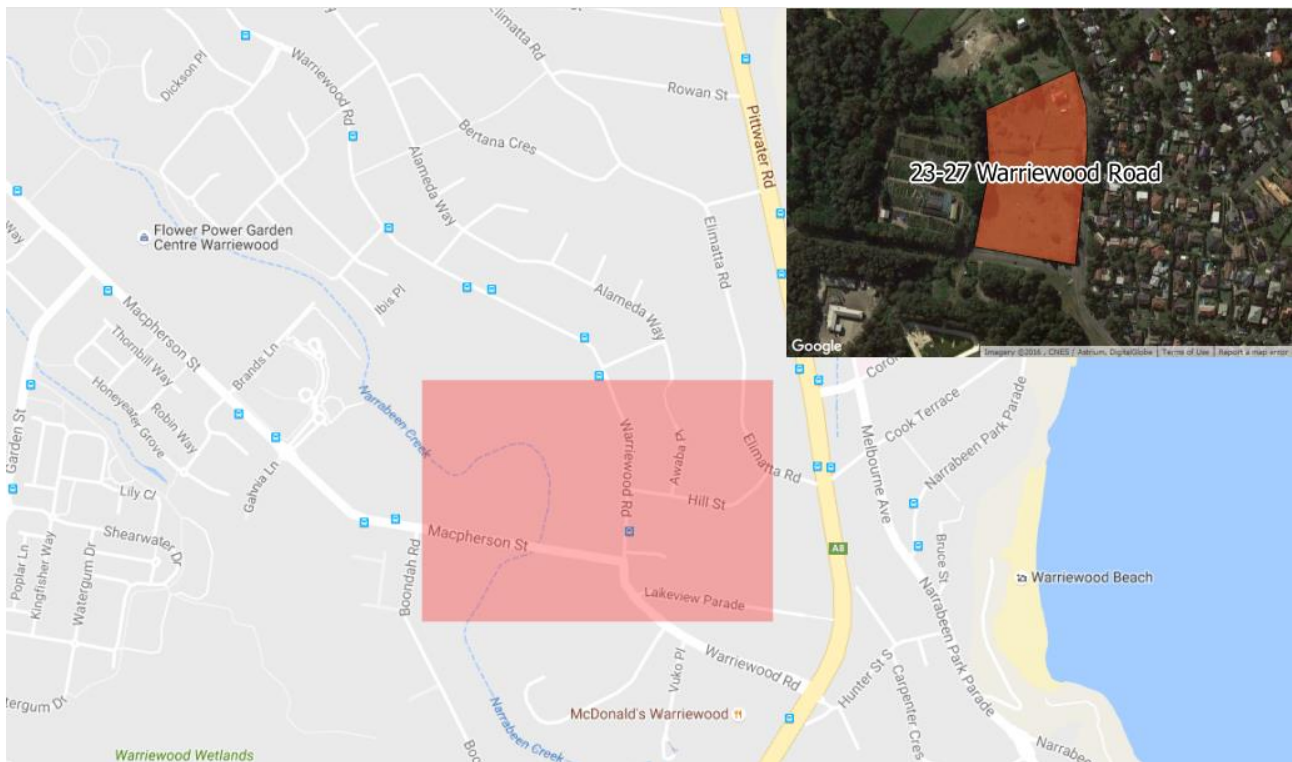
Predicted noise impacts of the development have been assessed based on the architectural documents (dated 27 June 2016) provided to WSP by Urbis, and revised architectural documents of the residential development (dated 10 August 2017) provided by Via Architects. The assessment indicates that noise impacts are expected to meet all relevant acoustic criteria.

# 1 INTRODUCTION

WSP was appointed to provide a Noise Impact Assessment for the proposed Arcare Warriewood development to be located at 23-27 Warriewood Road, Warriewood. Apartments and townhouses are proposed for the northern portion of the site, which will be located at 25-27 Warriewood Road. Figure 1.1 shows an overview of the site location and Figure 1-2 depicts the proposed site layout.

The site falls within the bounds of Northern Beaches Council (formerly Pittwater Council) and is subject to local controls. As such, a noise impact assessment is required as part of the Development Application for the proposed project. This document provides information on and assessment of the following:

- noise egress from the development
  - plant equipment noise emissions
  - noise emissions from operation of bowling greens, the club, car parks and cafe
  - impact on the surrounding roads due to increased traffic movements
- noise ingress to rooms
- inter-tenancy noise
- construction noise



Imagery: Google Maps

Figure 1.1 - Site overview

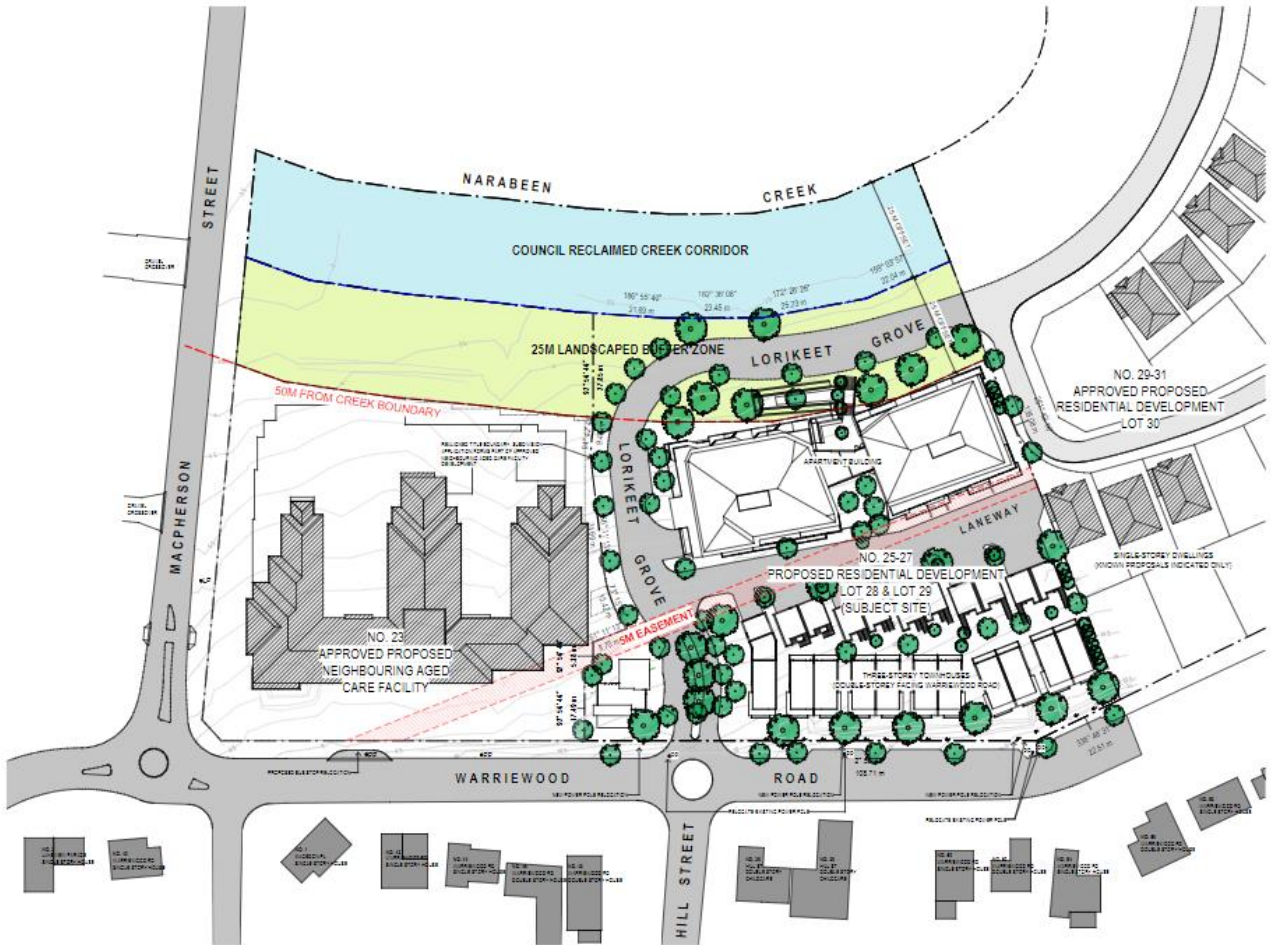


Figure 1-2 – Proposed development layout, aged care facility

# 1 NOISE SURVEY

## 1.1 SITE CONDITIONS AND MEASUREMENT LOCATION

An unattended background noise logger was deployed from Tuesday 11 October to Wednesday 19 October, 2016, on the development site opposite 44 Warriewood Road, Warriewood. The logger was set to record A-weighted, Fast, 15 minute statistical levels. Figure 1-1 shows the logging location relative to nearby sensitive receivers.



Figure 1-1 – Logging location and nearby receivers

Analysis of the Bureau of Meteorology’s daily weather data from the Terrey Hills weather station (the nearest weather station to the monitoring location) during the monitoring period indicated that the conditions were generally dry with relatively calm winds during the monitoring period and did not adversely affect the measurement results.

The noise environment consisted primarily of road traffic noise from Warriewood Road and general suburban hum. In the absence of road traffic, the childcare facility at 26 Hill Street was briefly audible but did not make a noticeable contribution.

Construction sites exist on the lot to the north of the development site and on Macpherson Street to the south. Intermittent use of an excavator on the northern site was audible only in the absence of other noise sources and did not make a noticeable contribution to the measured background levels. No activity from the works on Macpherson Street were audible at the logging location during site visits.

## 1.2 METHODOLOGY AND EQUIPMENT

The noise survey was conducted in accordance with AS1055.1 “Acoustics – Description and measurement of environmental noise Part 1: General Procedures” and guidance in *Environmental Protection Agency (Noise) regulations 1997*.

The microphone was located in a free-field position at least 3.5m away from any reflecting wall and at least 1.2m above the ground.

The sound level meters were field-calibrated using a Pulsar Model 105 acoustic calibrator both before and after noise measurements to monitor drifts in calibration. No drifts in excess of 1 dBA were noted throughout the monitoring exercise.

The sound level meters and calibrator were in current National Association of Testing Authorities (NATA) calibration at the time of use. Serial numbers and laboratory calibration due dates are shown below in Table 1.1.

Table 1.1 – Equipment details

EQUIPMENT DESCRIPTION	MANUFACTURER AND TYPE NO.	SERIAL NUMBER	CALIBRATION DUE DATE
Sound Level Meter	Norsonic Nor140	1404791	25/09/2017
Preamplifier	Norsonic 1209	14105	25/09/2017
Microphone	Gras 40AF	150762	25/09/2017
Calibrator	Pulsar - Model 105	55041	19/11/2016

## 1.3 RESULTS

A summary of the averaged measured noise levels is presented in Table 1.2. Results have been presented in accordance with the NSW INP time period classifications. Time history graphs of the noise logging results are presented in Appendix A.

Table 1.2 – Summary of measured noise levels

LOGGING LOCATION	AMBIENT NOISE LEVEL			RATING BACKGROUND LEVEL		
	dBA L <sub>EQ</sub> PERIOD			dBA L <sub>90 15-MINUTE</sub>		
	Day 7am – 10pm	Evening 6pm – 10pm	Night 10pm – 7am	Day 7am – 6pm	Evening 6pm – 10pm	Night 10pm – 7am
23-27 Warriewood Road	61	57	53	45	37	34



## 2 ASSESSMENT CRITERIA

Planning conditions for this development in line with New South Wales and Northern Beaches Council (formerly Pittwater Council) requirements have been obtained from the following documents. These are designed to protect the amenity of the new build occupants and the surrounding residences/community.

- Australia/New Zealand Standard 2107:2000 – Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors
- Building Code of Australia (BCA) – Volume One - Part F5 - Sound Transmission and Insulation 2015
- Building Code of Australia (BCA) – Volume Two – Section 3.8.6 – Sound Insulation
- Department of Environment and Climate Change NSW - Interim Construction Noise Guideline
- Department of Environment, Climate Change and Water - NSW Road Noise Policy 2011 (RNP)
- Department of Environment, Climate Change and Water NSW (DECCW) – Noise Guide for Local Government 2010 (NGLG)
- Environmental Protection Authority (EPA) – NSW Industrial Noise Policy 2000 (INP)
- Pittwater Council: Development Control Plan (DCP)

### 2.1 NOISE EGRESS

The following targets have been derived from the INP and are designed to protect the amenity of the surrounding residences and community. The INP has two components that must be considered as follows:

1. Controlling the **intrusive noise** impact on residences in the short term
2. Maintaining noise level **amenity** for residential and other noise sensitive land uses.

In assessing the noise impact of the proposed development, both components must be taken into account for residential receivers. In most cases, only one will become the limiting criterion and form the **project-specific** noise levels for the source under assessment.

Noise from vehicle movements on site are assessed under the INP. Increases in traffic noise generated by additional vehicle movements on surrounding public roads (as a result of the development) is assessed against the RNP.

#### 2.1.1 NSW INP CRITERIA

The NSW INP prescribes methods for determining the statutory environmental noise limits that apply to noise sensitive receivers (i.e. residences) with regards to noise due to industrial facilities and individual industrial noise sources.

The assessment procedure for industrial noise sources has two components:

- Controlling intrusive noise impacts in the short term for residences
- Maintaining noise level amenity for particular land uses for residences and other land uses.

In assessing the noise impact of industrial sources, both components must be taken into account for residential receivers. In most cases, only one will become the limiting criterion and form the project-specific noise levels for the industrial source under assessment.

The intrusiveness criterion for **residential** receivers is defined in the INP as:

$$\text{dBA } L_{\text{eq}, 15\text{-minute}} \leq \text{Rating Background Level} + 5 \text{ dBA}$$

Where the Rating Background Level (RBL) is described as:

*Rating Background Level (RBL) – the overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). The rating background level is the level used for assessment purposes. Where the rating background level is found to be less than 30dB(A), then it is set to 30dB(A).*

The amenity criteria exists to preserve the amenity of the area by limiting continuing increases in noise levels. Acceptable noise levels for various land uses, including residential and school classrooms, are provided in the INP, and are summarised in Table 2.1.

Table 2.1 – Extract from ‘Table 2.1 Amenity criteria’ from NSW INP

TYPE OF RECEIVER	INDICATIVE NOISE AMENITY AREA	TIME OF DAY	ACCEPTABLE NOISE LEVEL dBA $L_{\text{EQ PERIOD}}$	MAXIMUM NOISE LEVEL dBA $L_{\text{EQ PERIOD}}$
Residential	Suburban	Day (7 am-6 pm)	55	60
		Evening (6 pm-10 pm)	45	50
		Night (10 pm-7 am)	40	45
School classroom – internal	All	When in use	35	40

When the measured existing noise level ( $L_{\text{Aeq},15\text{minute}}$ ) from industrial sources is close to the Acceptable Noise Level when measured at a residential receiver, noise from new sources must be controlled to preserve the amenity of the area. No significant industrial noise sources were identified during the noise survey. Hence, the Acceptable Noise Levels in Table 2.1 form the amenity criteria.

### 2.1.2 PROJECT SPECIFIC CRITERIA

In assessing the noise impact of the proposed development on surrounding residential receivers, both the intrusiveness and amenity criterion must be considered. In most cases, only one criterion will become the limiting criterion and form the project-specific noise levels for the industrial source under assessment. The limiting criterion for the proposed development is the intrusive criterion.

A summary of all relevant criteria is presented in Table 2.2. The criteria apply to environmental noise emissions from the proposed development and are applicable at the property boundary of the nearest residence.

Table 2.2 – Project specific criteria

TIME PERIOD	RBL dBA $L_{90 15\text{-MINUTE}}$	INTRUSIVENESS CRITERION (RBL + 5) dBA $L_{\text{EQ 15-MINUTE}}$	EXISTING NOISE LEVEL dBA $L_{\text{EQ PERIOD}}$	AMENITY CRITERION dBA $L_{\text{EQ PERIOD}}$	PROJECT SPECIFIC NOISE LEVEL dBA $L_{\text{EQ 15-MINUTE}}$
Day	45	50	<51	55	50
Evening	37	42	<47	45	42
Night	34	39	<43	40	39

TIME PERIOD	RBL dBA L <sub>90 15-MINUTE</sub>	INTRUSIVENESS CRITERION (RBL + 5) dBA L <sub>EQ 15-MINUTE</sub>	EXISTING NOISE LEVEL dBA L <sub>EQ PERIOD</sub>	AMENITY CRITERION dBA L <sub>EQ PERIOD</sub>	PROJECT SPECIFIC NOISE LEVEL dBA L <sub>EQ 15-MINUTE</sub>
School classroom- when in use	n/a	n/a	n/a	35 <sup>1</sup>	35 <sup>1</sup>

Note 1: internal noise level

### 2.1.3 ROAD TRAFFIC NOISE

Increases in road traffic noise generated by additional vehicle movements caused by the development on surrounding roads is assessed using the RNP. The potentially most affected project related road is Warriewood Road.

Table 2.3 presents the road traffic noise criteria for residences affected by Warriewood Road. Noise criteria apply at 1m from the building façade.

Table 2.3 – Extract from RNP Section 2.3.1 – Noise assessment criteria – residential land uses

PROJECT TYPE/LAND USE	ASSESSMENT CRITERIA - dBA	
	DAY (7 AM-10 PM)	NIGHT (10 PM-7 AM)
Existing residences affected by additional traffic on existing sub-arterial roads generated by land use developments	60 dBA Leq, (15 hour) (external)	55 dBA Leq, (9 hour) (external)

In addition to the assessment criteria outlined in Table 2.3 above, any increase in the total traffic noise level at a location must also be considered as stated in the RNP application notes.

*“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 as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.”*

## 2.2 NOISE INGRESS

AS/NZS 2107:2016 provides recommended design criteria for conditions affecting the acoustic environment within occupied spaces. The relevant design recommendations applicable for this project are included in Table 2.4 below.

Table 2.4 – AS 2107: Internal noise criteria (residential buildings)

TYPE OF OCCUPANCY/ACTIVITY	RECOMMENDED DESIGN SOUND LEVEL dBA L <sub>EQ 15-MINUTE</sub>
<b>Houses and apartments near minor roads</b>	
Living areas	30 – 40
Sleeping areas	30 – 35
Work areas	35 – 40
Apartment common areas (e.g. foyer)	45 – 50

## 2.2.1 INTERNAL SOUND INSULATION CRITERIA

The townhouses are classified as Class 1, and apartments are Class 2 under the National Construction Code Building Code of Australia (BCA). Class 1 buildings must achieve the acoustic performance requirements given in Section 3.8.6 of Volume Two of the BCA. Class 2 developments must achieve the acoustic performance requirements outlined in Part F5 of Volume One the BCA.

The relevant acoustic requirements for Class 1 (townhouses) and Class 2 buildings (apartments) are outlined in Table 2.5.

Table 2.5 – NCC (BCA) acoustic requirements – Class 1 and 2 buildings

BUILDING ELEMENT	DESCRIPTION	IMPACT NOISE REQUIREMENTS	AIRBORNE NOISE REQUIREMENTS
Walls (Class 1)	Between a bathroom, sanitary compartment, laundry or kitchen and a habitable room (other than a kitchen) in an adjoining Class 1 building (dwelling).	Discontinuous construction	$R_w + C_{tr} \geq 50$
	Separating adjoining Class 1 buildings (dwellings) in all other cases to those listed above.	—	$R_w + C_{tr} \geq 50$
Walls (Class 2)	Separating sole occupancy units	—	$R_w + C_{tr} \geq 50$
	Separating a habitable room of a sole occupancy unit from a bathroom, sanitary compartment, laundry or kitchen in an adjacent sole occupancy unit	Discontinuous construction	$R_w + C_{tr} \geq 50$
	Separating a sole occupancy unit and a stairway, public corridor, public lobby or the like	—	$R_w \geq 50$
	Separating a sole occupancy unit and a plant room and lift shaft	Discontinuous construction	$R_w \geq 50$
	A door between a sole occupancy unit and a stairway, public corridor, lobby or the like.	—	$R_w \geq 30$
Floors (Class 2)	Separating sole-occupancy units and separating sole-occupancy units and a plant room, lift shaft, stairway, public corridor, public lobby or the like.	$L_{n,w} + C_1 \leq 62$	$R_w + C_{tr} \geq 50$
Services (Class 1 and 2)	A duct, soil, waste, water supply pipe and stormwater pipe located in a wall or floor cavity, serves or passes through more than one sole occupancy unit if the adjacent room is a habitable room (other than a kitchen)	—	$R_w + C_{tr} \geq 40$

	A duct, soil, waste, water supply pipe and stormwater pipe located in a wall or floor cavity, serves or passes through more than one sole occupancy unit if the adjacent room is a kitchen or any other non-habitable room.	—	$R_w + C_{tr} \geq 25$
Pumps (Class 2)	The point of connection between the service pipes in a building and any circulating or other pump.	A flexible coupling at the connection	—

### 2.2.2 SLEEP DISTURBANCE CRITERIA

The NSW Road Noise Policy (RNP) provides discussion on sleep disturbance referring to international studies and empirical data.

The discussion presented in the RNP concludes as follows:

- One or two noise events per night, with maximum internal noise levels of 65-70 dB(A), are not likely to affect health and wellbeing significantly.
- Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions.

Based on the above guidance provided by the RNP, internal levels in a sleeping area should be assessed against the following criteria:

- Up to two events in the night period (10 pm to 7 am) may reach 70dBA  $L_{max}$
- The remaining vehicle pass-by events in the night period should not exceed 55 dBA  $L_{max}$  internally.

# 3 ASSESSMENT

## 3.1 PLANT NOISE EMISSIONS

As a detailed mechanical design will not be undertaken until the design stage of the development, it is not possible at this stage to predict noise to nearby receivers. However, it is expected that external building services plant will include:

- split system units or centralised ducted air conditioning systems
- toilet, kitchen, laundry, car park or general extract fans
- refrigeration units.

As the design progresses, these and any other noise emitting equipment will be designed to not exceed the project specific criteria stated in Section 2.1.2 as measured at the most affected noise sensitive receiver. This can be achieved with consideration in the selection, design and placement of all mechanical equipment that emit noise. If equipment is in excess of the given criteria, further acoustic mitigation can be provided. These further acoustic measures may include, but are not limited to:

- careful placement of equipment.
- attenuators.
- acoustic louvres.
- noise barriers or enclosures.
- acoustic absorption on barriers and enclosures.

## 3.2 TRAFFIC NOISE GENERATION

In order to assess additional noise levels at nearby receivers, a calculation of traffic noise generated by the development has been undertaken. The INP and RNP criteria established in Section 2.1 have been used for this assessment.

### 3.2.1 OPERATIONAL TRAFFIC NOISE

The following parameters have been included in the calculation of noise from vehicle movements entering and exiting the site during day-to-day operation of the development based on a worst-case 15 minute scenario as advised by the traffic consultant, TTM Consulting:

- Cars travel from Warriewood Road into Lorikeet Grove located opposite 48 Warriewood Road (44 m from the entrance to the site).
- 52 cars either enter or leave the premises within a peak hour period, equating to approximately 13 cars within a fifteen minute assessment period.
- A car movement assumes ten seconds of pass-by noise and 1 door slam event.

Noise levels during the evening and night are assessed over a 15 minute period to provide a conservative assessment. It is considered that where compliance is achieved over a worst-case 15 minute period, compliance would also be achieved with the criteria over the entire evening and night period.

Table 3.1 presents typical vehicle pass-by noise levels based on previous measurements.

Table 3.1 - Vehicle noise data used within calculation

	SOUND POWER LEVEL (dB) AT EACH OCTAVE BAND CENTRE FREQUENCY								dBA
	HZ								
	63	125	250	500	1K	2K	4K	8K	
Vehicle pass-by	69	76	75	77	79	77	75	69	83

Based on noise measurements, a car door slam is calculated as a 1 second event with a sound power level of 91 dBA. Table 3.2 shows the comparison of the predicted noise levels and the INP criteria based on the calculated number of car movements.

Table 3.2 - INP traffic assessment

	PROJECT SPECIFIC CRITERIA	PREDICTED LEVEL AT 42 WARRIEWOOD ROAD	MEETS INP CRITERIA
Day (7 am-6 pm)	50 dBA $L_{eq}$ (15 minute)	36 dBA $L_{eq}$ (15 minute)	Yes
Evening (6 pm-10 pm)	42 dBA $L_{eq}$ (15 minute)	36 dBA $L_{eq}$ (15 minute)	Yes
Night (10 pm-7 am)	39 dBA $L_{eq}$ (15 minute)	36 dBA $L_{eq}$ (15 minute)	Yes

Note that the vehicle movement numbers include traffic generated by the aged care facility and are not solely due to the townhouses and apartments. As the noise from movements generated by the overall site (aged care facility and proposed residences) complies with the INP criteria, it can be concluded that the vehicle movements due to the residences complies with the criteria.

### 3.2.2 ROAD TRAFFIC NOISE

The RNP defines a significant increase in traffic noise as that being one of 2dB or greater. To realise this level of increase through an increase in traffic volume alone, the traffic volume would need to increase by almost 60 per cent. Considering that the project site is located on Warriewood Road, which is described as a collector street by the Warriewood Valley Master Plan, traffic generated by the facility is not anticipated to significantly increase road traffic noise on Warriewood Road.

### 3.2.3 CONSTRUCTION TRAFFIC NOISE

At this early stage in the design, details regarding the construction approach have not been finalised. It is not likely that this information will be available until the final stages of design. Therefore, a review of construction traffic noise has not been undertaken. However, as the construction stage may involve truck and heavy vehicle movements, the potential for impacts to occur should be considered as part of a construction management plan with reference to the RNP.

## 3.3 NOISE INGRESS

The façade design and ventilation strategy both contribute to the noise ingress to an internal space.

Noise levels at the site were measured as 53-61 dBA  $L_{eq}(15\text{ minute})$  as detailed in Section 1.3

Table 3.3 below provides an indicative glazing specification to control noise ingress through the façade. The indicative specification takes into account typical room dimensions, and is designed to meet the internal ambient noise level criteria provided in Section 2.2 when windows are closed.

Table 3.3 –Indicative façade glazing requirements

FAÇADE	GLAZING RATING	EXAMPLE GLAZING
Townhouses facing Warriewood Road	32 dB R <sub>w</sub>	6mm sealed glass (Pilkington)
Apartments on Lorikeet Grove, facing east (towards Warriewood Road)	26 dB R <sub>w</sub>	6mm sealed glass (Pilkington)

With the above considerations, it is expected that the acoustic criteria established in section 2.2 will be achieved when windows are closed. Façade constructions will be further specified in the detailed design stage to meet the required internal noise limits.

### 3.4 INTERNAL SOUND INSULATION

Noise between apartments that are vertically or laterally adjacent shall be controlled in line with legislative criteria set out in the BCA Volume One Part F5. For the townhouses, noise shall be controlled in line with the criteria outlined in the BCA Volume Two, Section 3.8.6. These criteria are provided in section 2.2.1. If the classification of the building changes, sound insulation requirements should be re-evaluated in accordance with the BCA.



# 4 CONSTRUCTION NOISE AND VIBRATION

Noise and vibration emitted from the site during the construction phase may impact nearby sensitive receivers. Guidance on the control and management of construction noise and vibration is set out in the Department of Environment and Climate Change - *Interim Construction Noise Guideline 2009 (ICNG)* and *Assessing Vibration – A Technical Guideline 2006*.

As the nearest and most affected receivers will be the residential premises bounding the site, construction noise should be managed to avoid adverse impacts. Table 4.1 presents construction noise management levels and their application as stated in the ICNG.

Table 4.1 – ICNG Noise management levels at residential receivers

TIME OF DAY	MANAGEMENT LEVEL $L_{Aeq(15MIN)}$	HOW TO APPLY
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise.  Where the predicted or measured $L_{Aeq(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.  The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise.  Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noise activities can occur, taking into account:  times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences)  if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours.  The proponent should apply all feasible and reasonable work practices to meet the noise affected level.  Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.  For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Road traffic associated with the construction activity would be subject to the requirements of the Road Noise Policy detailed in Section 2.1.3.

# 5 CONCLUSION

WSP was appointed to provide a Noise Impact Assessment for the proposed residential development located at 25-27 Warriewood Road, Warriewood, which forms the northern portion of the 23-27 Warriewood Road site.

The primary noise source near the site was observed to be traffic along Warriewood Road. In the absence of traffic, noise from a nearby childcare facility at 26 Hill Street could be heard intermittently but did not dominate the noise environment.

The assessment has been based on the architectural documents provided to WSP by Via Architects. If any changes to the development affecting noise emissions were to occur, they would need to be re-assessed to ensure compliance with the relevant criteria.

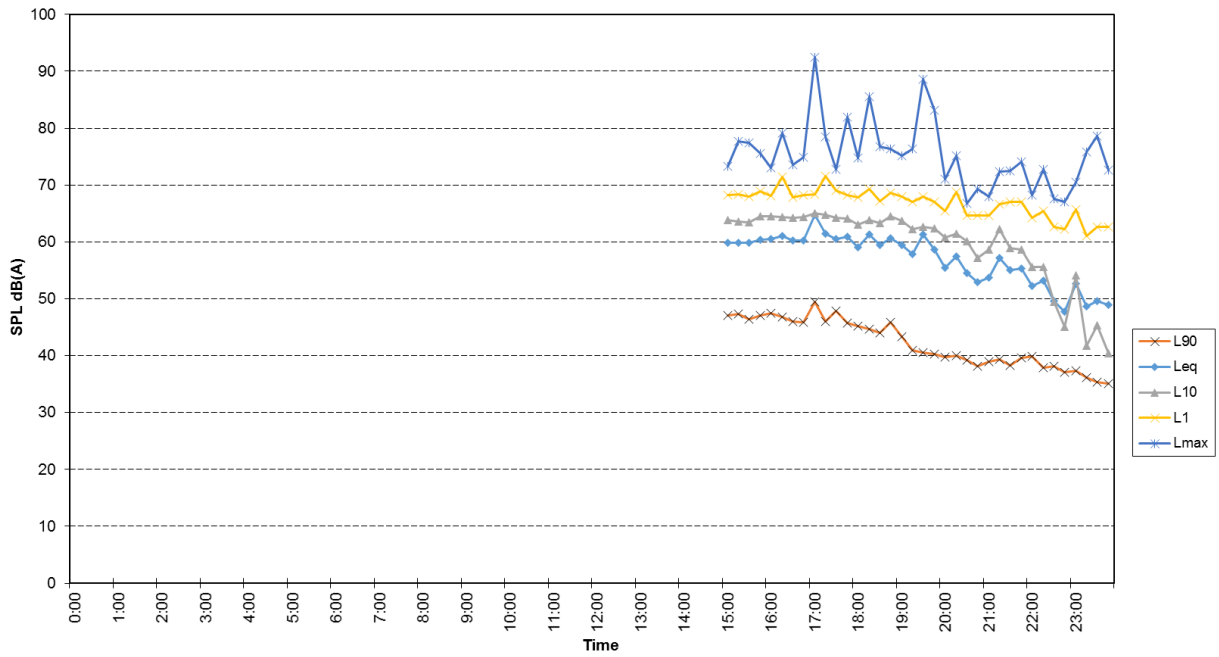
The predicted noise impacts of the development have been assessed and are expected to comply with the relevant acoustic criteria. Industrial and road noise emissions were assessed and found to comply with the criteria outlined in the NSW Industrial Noise Policy and NSW Road Noise Policy, respectively. An indicative façade glazing requirement has been determined based on ambient noise and required internal levels. Partition construction shall meet the acoustic requirements outlined in the BCA.

# APPENDIX A

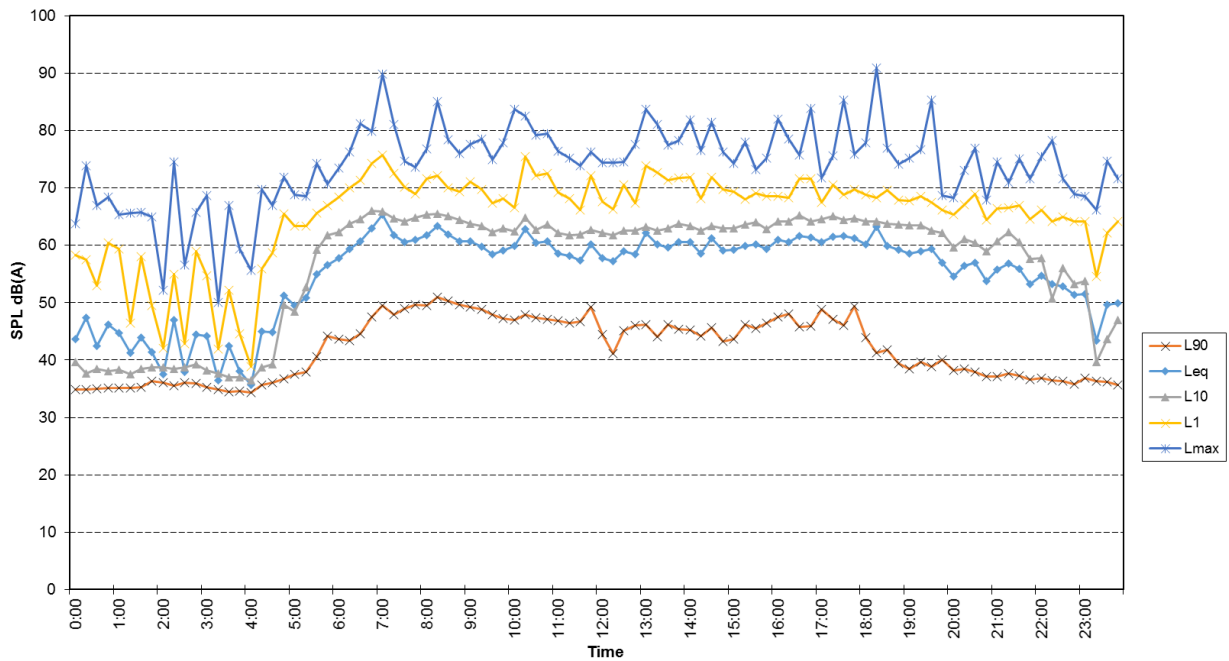
## NOISE MEASUREMENT RESULTS



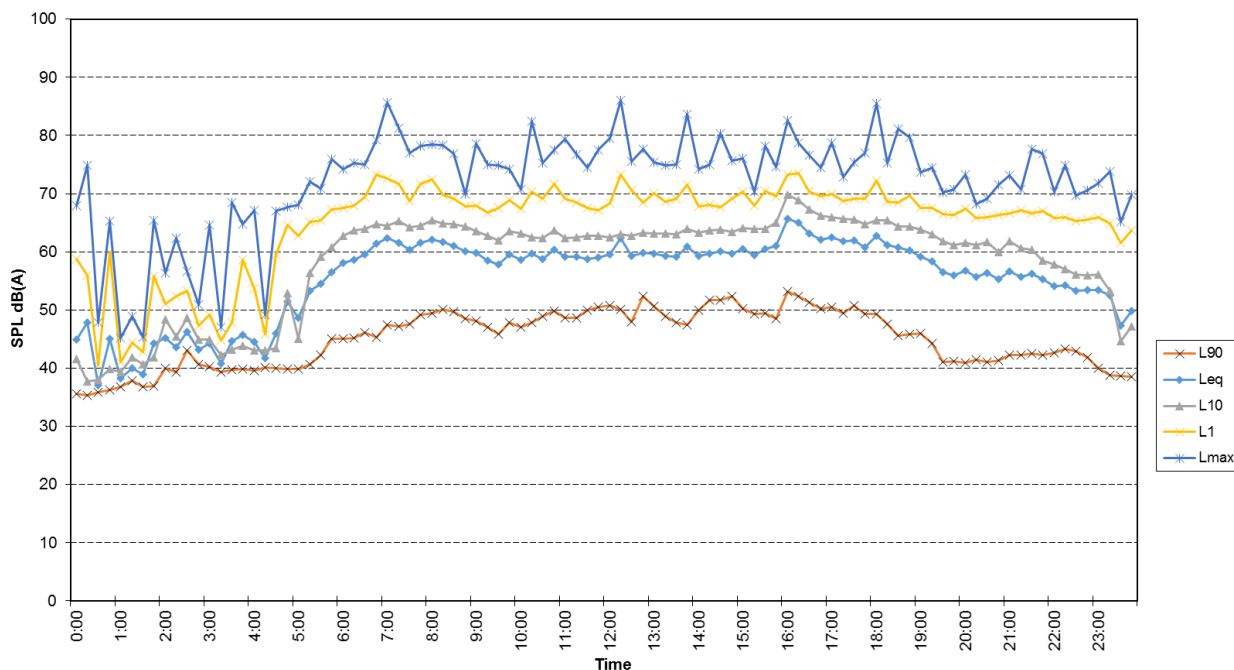
Location - NL1  
 Measured Noise Levels - Tuesday 11/10/2016



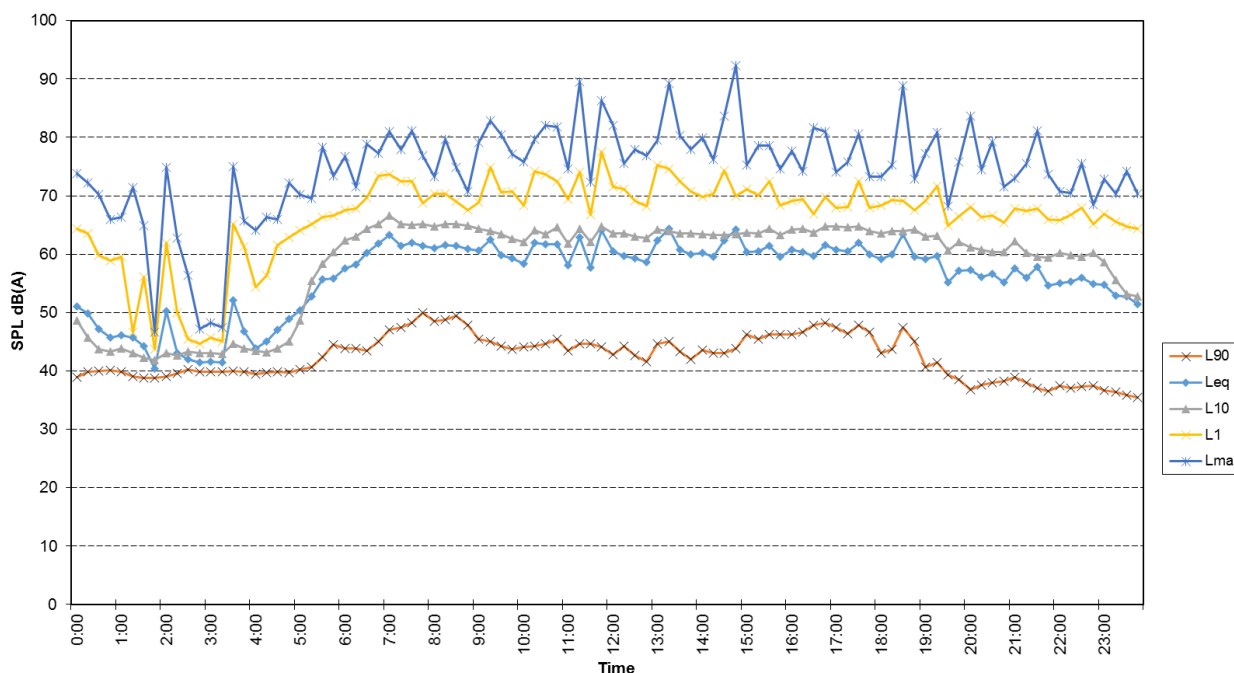
Location - NL1  
 Measured Noise Levels - Wednesday 12/10/2016



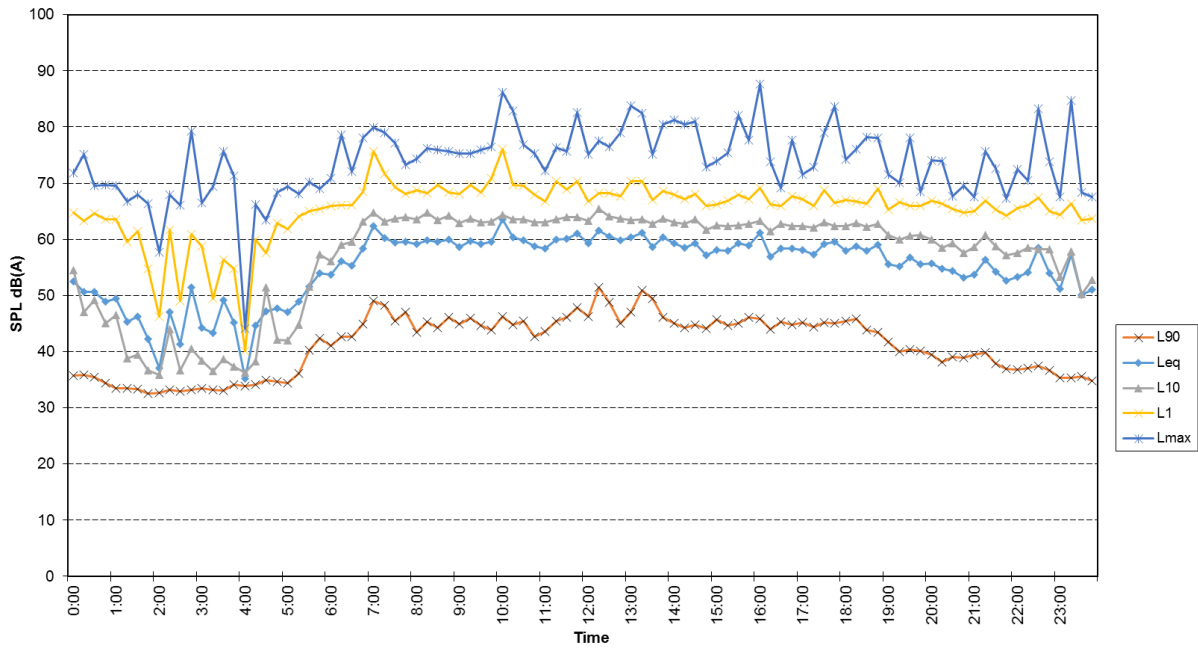
Location - NL1  
 Measured Noise Levels - Thursday 13/10/2016



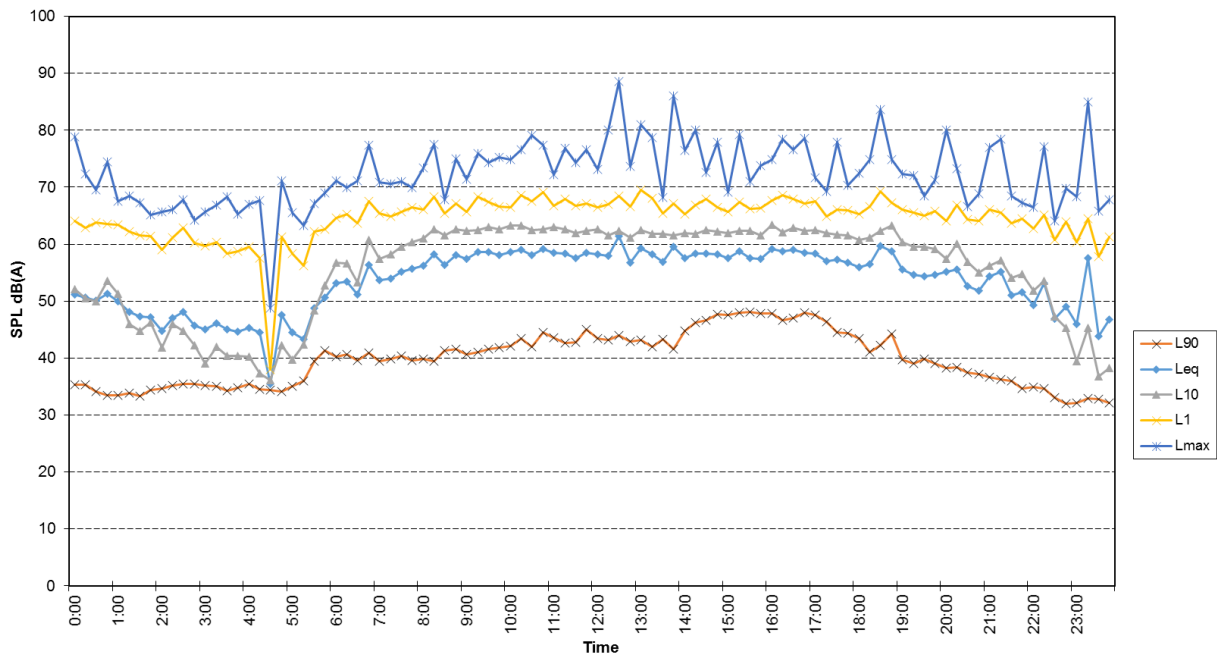
Location - NL1  
 Measured Noise Levels - Friday 14/10/2016



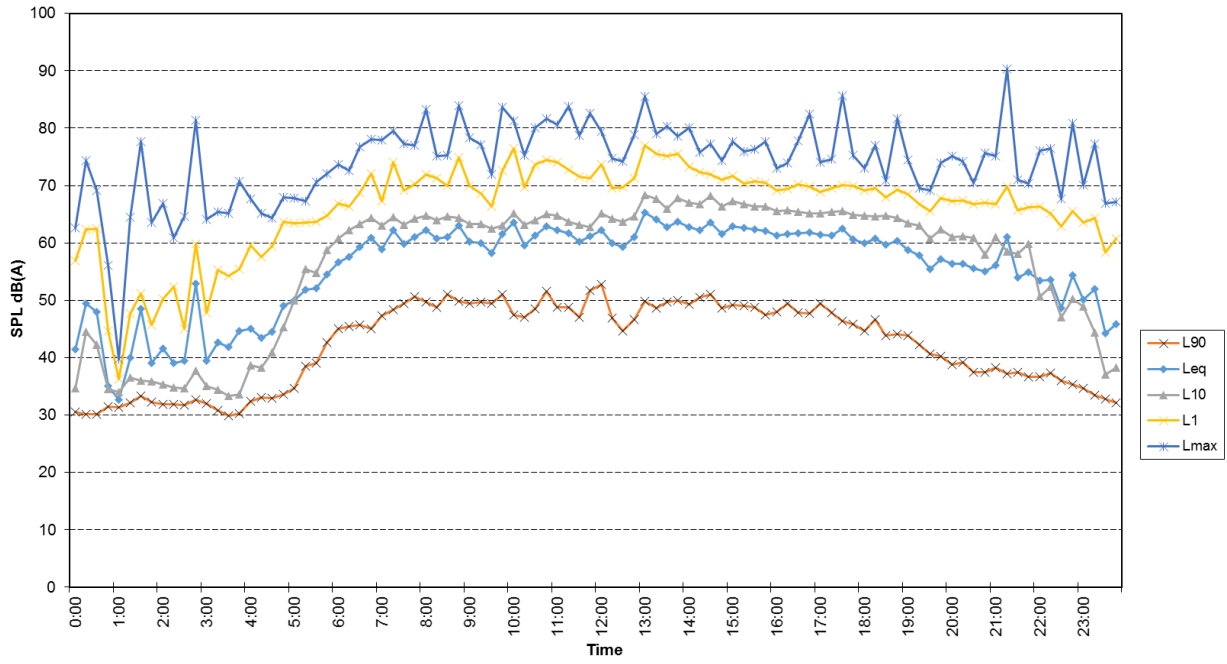
Location - NL1  
 Measured Noise Levels - Saturday 15/10/2016



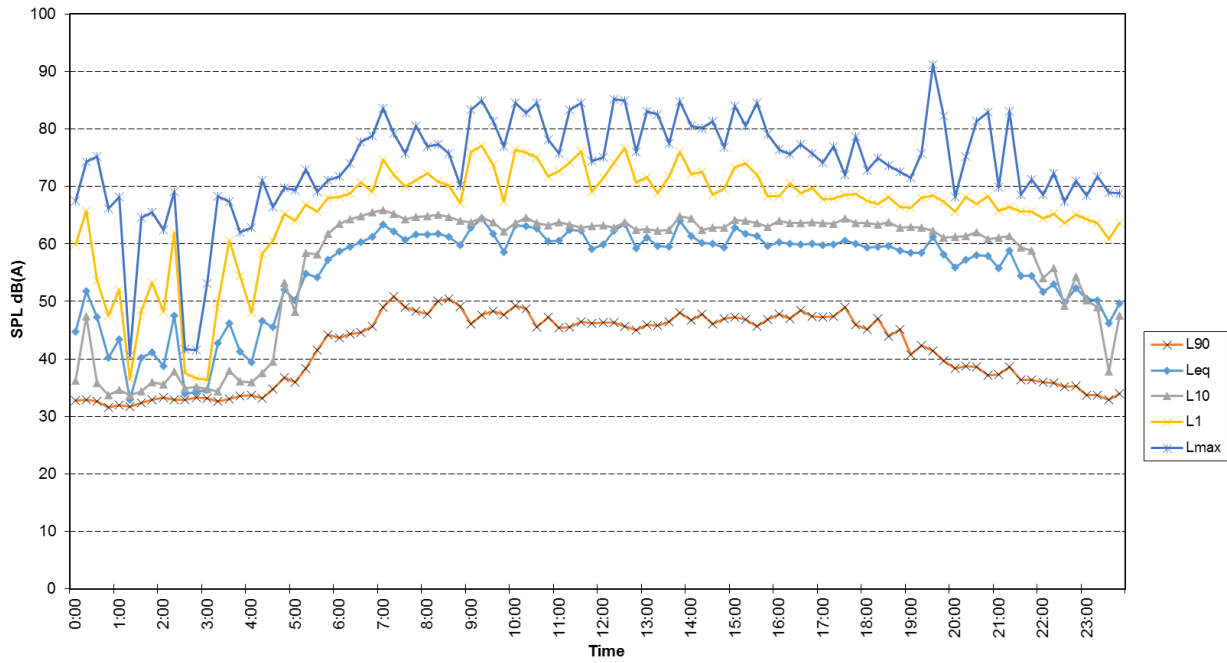
Location - NL1  
 Measured Noise Levels - Sunday 16/10/2016



Location - NL1  
 Measured Noise Levels - Monday 17/10/2016



Location - NL1  
 Measured Noise Levels - Tuesday 18/10/2016



Location - NL1  
 Measured Noise Levels - Wednesday 19/10/2016

