

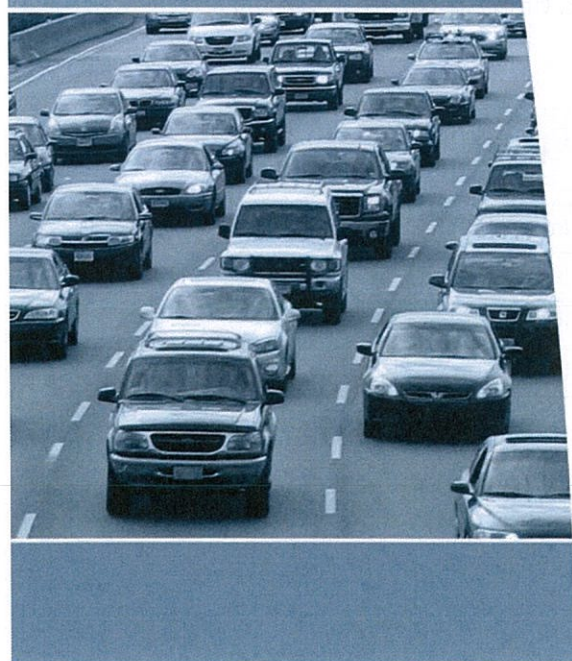
PLANS AND DOCUMENTS
referred to in the PDA APPROVAL

21 MAY 2014

MEDQ

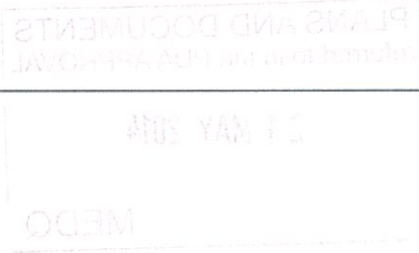


**Proposed Mixed Use
5 Hercules Street Hamilton
Acoustic Assessment**



Pamada

Reference: 13BRA0221 R01 2
23 January 2014



© 2014 - TTM Consulting Pty Ltd

ABN 65 010 868 621

Level 1/129 Logan Road, Woolloongabba

PO Box 1310 Coorparoo BC QLD 4151

T: (07) 3327 9500 F: (07) 3327 9501 E: ttmbri@ttmgroup.com.au

Rev No.	Author	Reviewed/Approved		Description	Date
		Name	Signature		
A	Alan Subkey			Internal Draft	11/12/2013
0	Alan Subkey	Keith Hewett		Issued	16/12/2013
1	Alan Subkey			Issued	21/12/2014
2	Alan Subkey			Issued	23/12/2014
3					



Table of Contents

1. INTRODUCTION	1
1.1. References	1
1.2. Drawings	1
1.3. PROJECT DESCRIPTION	2
2. SITE DESCRIPTION	3
2.1. Site Location	3
2.2. Acoustic Environment	3
2.3. Affected Receivers	3
3. NOISE CRITERIA	4
3.1. Noise Impact Assessment Planning Scheme Policy (NIAPSP)	4
3.2. Queensland Development Code	6
3.3. Summary of Criteria	7
4. Measurements	8
4.1. Noise Monitoring	8
4.2. Noise Monitoring Locations	8
4.3. Onsite Activity Noise Levels	9
5. ANALYSIS AND RESULTS	10
5.1. Emissions	10
5.2. Imissions	11
5.3. Passenger Terminal Noise	12
6. RECOMMENDATIONS	16
6.1. Road Traffic Noise	16
6.2. Delivery and Waste Removal	16



Table Index

Table 1: NIAPSP Section 6.1	5
Table 2: Appendix A of AS 1055.2	5
Table 3: Internal Noise Limits for Residential Dwellings from AS 2107.	6
Table 4: Noise Category Levels – QDC MP4.4 Road Traffic Noise (Schedule 3).	6
Table 5: Road Traffic Noise Assessment Criteria.	7
Table 6: Measured Relevant Levels at the Noise Logger Locations.	8
Table 7: Traffic Volumes.	8
Table 8: Average Maximum Noise Levels from Typical Activities	9
Table 9: Average Maximum Noise Levels from Typical Activity at Southern Receiver.	11

Figure Index

Figure 1: Site Location	3
Figure 2: Ground level, showing entry to car parks	10
Figure 3: Level 1 with indicative glazing	13
Figure 4: Level 2 with indicative glazing	13
Figure 5: Level 3 with indicative glazing	14
Figure 5: Levels 4 to 12 with indicative glazing	14
Figure 6: Levels 13 to 19 with indicative glazing	15

Appendices

Appendix A Noise Logging	17
--------------------------	----



1. INTRODUCTION

TTM has been engaged by Pamada to prepare an acoustical assessment for a proposed mixed use residential development at 5 Hercules Street, Hamilton. This report will form part of the development application for consideration by EDQ.

In undertaking this assessment, unattended road traffic noise monitoring that was previously conducted has been used. This report addresses noise emissions as well as noise immissions impacting the proposed development. Based upon the predicted noise levels, recommendations regarding acoustic treatments were specified.

1.1. References

1. Brisbane City Council's (BCC) *City Plan 2000* "Noise Impact Assessment Planning Scheme Policy" (NIAPSP).
2. Australian/New Zealand Standard *AS/NZS 2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors* (AS 2107);
3. Australian Standard *AS 1055.2 Acoustics—Description and measurement of environmental noise Part 2: Application to specific situations* (AS 1055.2),
4. *Queensland Development Code*, Part MP 4.4 - 'Buildings in a Transport Noise Corridor', (MP 4.4).

1.2. Drawings

Our report is based on the CCN Architects drawings as listed below:

Drawing Number	Issue	Date
P1312-DA 229	3	19/01/2014
P1312-DA 230	3	19/01/2014
P1312-DA 231	3	19/01/2014
P1312-DA 232	3	19/01/2014
P1312-DA 233	3	19/01/2014
P1312-SK 234	3	19/01/2014
P1312-DA 235	3	19/01/2014
P1312-DA 236	3	19/01/2014
P1312-DA 237	3	19/01/2014
P1312-DA 238	3	19/01/2014
P1312-DA 239	3	19/01/2014
P1312-DA 240	3	19/01/2014
P1312-DA 241	3	19/01/2014
P1312-DA 242	3	19/01/2014
P1312-DA 243	3	19/01/2014

1.3. PROJECT DESCRIPTION

The proposal is to develop a residential building at 5 Hercules Street, Hamilton, incorporating the following:

1. Gross floor area – total 14,580sqm;
2. 1 retail space;
3. A total of 151 apartments consisting of:
 - a. 65 x 1 bedroom;
 - b. 71 x 2 bedroom;
 - c. 15 x 3 bedroom;
4. 155 carspaces;
5. Roof top meeting and entertainment areas plus gardens.

2. SITE DESCRIPTION

The site description is:

- 5 Hercules Street, Hamilton

The north, west and east boundaries are either short term motel accommodation or residential and commercial uses. All of these are considered noise sensitive receivers.

2.1. Site Location

Figure 1: Site Location



2.2. Acoustic Environment

The locale is dominated by road traffic noise from Kingsford Smith Drive. There is also local road noise from vehicles using Hercules St as well as port activity such as docked passenger ships.

2.3. Affected Receivers

The receivers are those premises near the proposed development to the west, south west and south east. The adjacent buildings to the north are commercial and not considered noise sensitive receivers.

3. NOISE CRITERIA

We have based our assessment on the Brisbane City Councils *Noise Impact Assessment Planning Scheme Policy (NIAPSP)*. *NIAPSP* has been used in the absence of any similar policy guidance applicable to the Northshore Hamilton Priority Development Area. If one considers environmental issues in a hierarchy then Environmental Protection Act would be at the top of the hierarchy and the *NIAPSP* is simply a means of complying with the Act. *NIAPSP* simply provides a prescriptive means of compliance, which are relevant in an urban environment.

3.1. Noise Impact Assessment Planning Scheme Policy (NIAPSP)

NIAPSP states that:

Each of the three methodologies can be used to determine both emission levels and immission levels for a development but there will be a different emphasis depending on the type of development and its location. For example a residential block development application would focus more on the acceptable amenity that future occupants would have (immission) whereas industrial development would focus more on its emissions received by the adjacent uses. Refer to Council's *Noise Planning Guidelines* for further guidance.

The three methodologies of assessment are:

Methodology One: Comparison of like parameters or descriptors—Comparison, using a suitable sound descriptor, of the ambient sound character of an area without the development to that resulting with the development;

Methodology Two: Application of AS 2107 - Comparison with a defined set of sound pressure levels, for specified indoor areas occupied by people set out in Table 1 of AS2107—1997;

Methodology Three: Sleep Awakenings - Comparison with sleep levels.

Each of the three methodologies can be used to determine both emission levels and immission levels for a development but there will be a different emphasis depending on the type of development and its location.

Noise emissions include carparking noise, refuse collection, and noise due to mechanical plant associated with the proposed development.

In this case immissions are mostly due to transport noise specifically road traffic noise.

3.1.1. Background Creep

One of the aims of the policy is to prevent background creep, i.e. the progressive increase in background noise levels as new noise emitting activities locate in the area. To achieve this aim, the outside noise levels arrived at after applying the above emission assessment methodologies must not exceed the levels detailed in the table below:

Table 1: NIAPSP Section 6.1

Noise area category Appendix A AS1055.2(a)	Permissible (sic) level of exceedance of $L_{A90,T}$ for the appropriate time of day		
	Where there is residential development	Where there is no residential development	Where background levels already exceed stated levels in AS1055.2 (i.e. without the proposed development)
R1	by 5dB(A)	N/A	The development's noise contribution must still comply with the stated levels in AS1055.2
R2	by 5dB(A)	N/A	
R3	by 0dB(A)	By 10dB(A)	
R4			
R5			
R6			

Table 2: Appendix A of AS 1055.2

Noise area category	Description of Neighbourhood	Average background A-weighted sound pressure level, $L_{A90,T}$		
		0700-1800 Monday to Saturday	1800-2200	2200-0700
		0900-1800 Sunday and public holidays		
R1	Areas with negligible transport	40	35	30
R2	Areas with low density transport	45	40	35
R3	Areas with medium density transport or some commerce or industry	50	45	40
R4	Areas with dense transportation or some commerce or industry	55	50	45
R5 (see note 3)	Areas with very dense transportation or in commercial districts or bordering industrial districts	60	55	50
R6 (see note 3)	Areas with extremely dense transportation or within predominantly industrial districts	65	60	55

Note 3: Some industrial and commercial sites are not predominant sources of high background noise levels.

3.1.2. Outdoor Areas

For outdoor recreation areas, NIAPSP states that the L_{Aeq} averaged over a 24 hour period should not exceed 55 dB(A). The maximum $L_{Aeq,1hr}$ for any hour should not exceed 60 dB(A).

The road traffic noise criteria applied to the proposed development is pursuant to the Brisbane City Council's (BCC) *City Plan 2000* "Noise Impact Assessment Planning Scheme Policy" (NIAPSP). The assessment methodology requires that road traffic noise impacting the site is investigated for the ten year planning horizon (year 2023). Road traffic noise levels are

assessed as an outdoor level in recreation areas, and as internal noise levels inside living, work and sleeping areas.

3.1.3. AS 2107

The internal noise limits are the maximum recommended design sound levels from AS 2107 and are presented in Table 3.

Table 3: Internal Noise Limits for Residential Dwellings from AS 2107.

Type of occupancy/activity	Recommended design sound level, $L_{Aeq,T}$ dB(A)	
	Satisfactory	Maximum
7 RESIDENTIAL BUILDINGS		
Houses and apartments near major roads—		
Living areas	35	45
Sleeping areas	30	40

3.2. Queensland Development Code

The Queensland Development Code Part MP 4.4 - 'Buildings in a Transport Noise Corridor' specifies Noise Categories to ensure that habitable rooms of residential buildings are adequately protected from transport noise.

The Noise Categories list the minimum acoustic R_w ratings for each building component to comply with the indoor sound levels as outlined in Australian Standard AS 2107. Details regarding the noise categories and acceptable forms of construction can be found within Schedule 1 and 2 of the QDC document. The triggers for each noise category are summarised in Table 4.

The treatments specified in Schedules 1 and 2 of MP 4.4 should only be applied if a detailed acoustic assessment has not been conducted of the development. As this report provides a detailed acoustic assessment MP 4.4 will not be discussed further.

Table 4: Noise Category Levels – QDC MP4.4 Road Traffic Noise (Schedule 3).

Noise Category	Level of Transport Noise* ($L_{A10,18Hour}$) for State-Controlled Roads and Designated Local Government Roads
Category 4	≥ 73
Category 3	68 – 72
Category 2	63 – 67
Category 1	58 – 62
Category 0	≤ 57

* Measured at 1 metre from the façade of the proposed or existing building.

3.3. Summary of Criteria

Table 5 outlines the assessment criteria based upon achieving the noise level objectives for Brisbane City Council.

Table 5: Road Traffic Noise Assessment Criteria.

Description	Location/situation	Criteria
Immissions	Communal Recreational Areas	55dB(A) $L_{Aeq(24hour)}$ (Free Field)
	Private Recreational Areas	55dB(A) $L_{Aeq(24hour)}$ (Façade Corrected)
	External façade	60dB(A) $L_{Aeq(1hour)}$ (Façade Corrected)
Immissions and Emissions	Internal noise limits	As per Table 3
Emissions	Background Creep	55/50/45 dB(A) L_{A90T}
	On site noise	AS 2107 to residential L_{Aeq}
	Plant Noise	Comparison of like parameters to residential receivers L_{Aeq}



4. Measurements

4.1. Noise Monitoring

An ARL EL316 environmental noise monitor was placed on the northern end of 5 Hercules Street, Hamilton to measure existing ambient noise levels. The microphone was approximately 1.4 metres above ground level and was located to be representative of noise impacts experienced in the vicinity of the proposed development site at 5 Hercules Street.

Previously another logger was placed close to Kingsford Smith Drive to measure road traffic noise, to assist in calibrating our model..

4.2. Noise Monitoring Locations

The unattended noise monitoring locations are shown in Figure 1.

4.2.1. Measured Road Traffic Noise Levels

Table 6 presents measured logged levels at the unattended monitoring locations.

Table 6: Measured Relevant Levels at the Noise Logger Locations.

Descriptor	Measured Level dB(A)	
	Kingsford Smith Drive	Hercules Street
L _{A10,18hr}	72	65
Day-time L _{Aeq,1 hr}	71	67
Night-time L _{Aeq,1 hr}	68	59
L _{Aeq,24 hr}	68	61

Graphical presentation of the noise logger levels are presented in Appendix A.

4.2.2. Traffic Volumes

The existing traffic volumes and percentage heavy vehicles for Kingsford Smith Drive were obtained from Veitch Lister Consulting. Predicted traffic volumes are based upon projections for the year 2022 and are as follows:

Table 7: Traffic Volumes.

Description	Number of Vehicles (18 hour)	% Heavy Vehicles
Surveyed (2011) Traffic Volumes	50,271	13
Current (2012) Traffic Volumes	50,724	
Predicted (2022) Traffic Volumes	55,478	

Predicted volumes are based upon a 0.9% increase per annum as per Veitch Lister Consulting. Further extrapolation to the year 2024 yields the number of vehicles (18 hour) of 56481. The 18hr traffic volumes are taken to be 95% of the Average Annual Daily Traffic volumes.

4.3. Onsite Activity Noise Levels

The noise sources associated with the proposed development were based on previous similar investigations, with average maximum levels associated with these activities presented in

Table 8. The noise sources used were selected as they represent the likely activities onsite that have the potential to cause noise annoyance to the nearest noise sensitive properties.

Table 8: Average Maximum Noise Levels from Typical Activities

Noise Source	Measured Level L _{AMax} (dB(A)) @ 1 Metre	Correction Factor dB(A)*	Corrected Level L _{AMax} (dB(A)) @ 1 Metre
Car door closure	78	+ 5 (impulsive)	83
Car starting	75	N/A	75
Car passby @ 5 km/hr	77	N/A	77
Waste removal	92	+ 5 (impulsive)	97
Conversation	75	N/A	75
Goods deliveries	85	N/A	85

*Correction due to tonality and impulsiveness as per AS1055.

5. ANALYSIS AND RESULTS

5.1. Emissions

The noise sources associated with the proposed development were based on previous similar investigations, with average maximum levels associated with these activities presented in Table 8. The noise sources used were selected as they represent the likely activities onsite that have the potential to cause noise annoyance to the nearest noise sensitive properties.

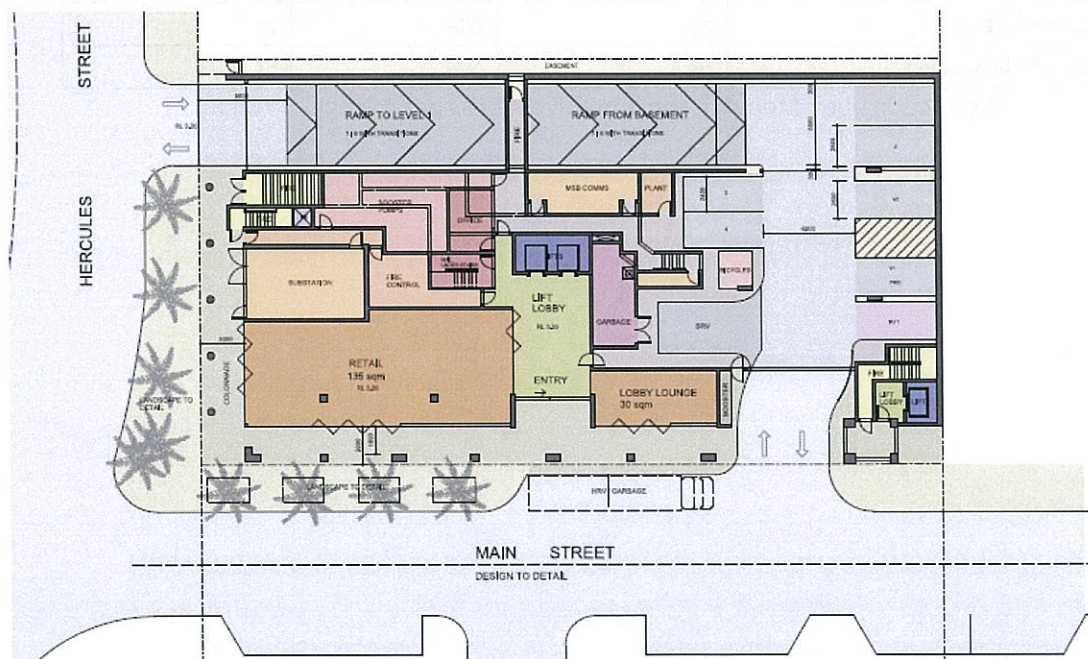
5.1.1. Receivers to the east and north

At ground level the plans (Figure 2) and elevations show that the building will be enclosed in these two directions, therefore there noise will be contained to the ground floor in that direction. Plant noise is discussed elsewhere.

5.1.2. Receivers to the west

The western elevation of the ground floor is shown open in that direction for car access. Noise sources will be cars arriving and leaving the premises and are not expected to create any more noise than the surrounding road network.

Figure 2: Ground level, showing entry to carparks



As the noises present in the receiver to the west will be similar to those in the second column even with the correction for impulsiveness, noise levels will be lower at the receivers when like parameters are compared.

5.1.3. Receivers to the south

The southern elevation of the ground floor is open to the residential receivers in that direction. Noise levels have been calculated with direct line of site from the source to the receiver. The criterion for a bedroom according to AS 2107 is a maximum of L_{Aeq} 40dB.

Table 9: Average Maximum Noise Levels from Typical Activity at Southern Receiver.

Noise Source	Typical Measured noise levels L_{Amax} (dB(A)) @ 1 m	Noise emissions at 1m with correction	Reduction (R) with distance	Corrected Level L_{Amax} (dB(A)) @ at nearest receiver	L_{Amax} (dB(A)) inside a bedroom
Car door closure	78	83*	40	43	38
Car starting	75	75	40	35	30
Car passby @ 5 km/hr	77	77	40	37	32
Waste removal	92	97*	34	63	58
Conversation	75	75	40	35	30
Goods deliveries	85	85	34	51	46

*Correction due to impulsiveness as per AS1055;

As can be seen the L_{Amax} will be lower than the L_{Aeq} except for waste removal and deliveries. As the L_{Amax} will always be lower than the L_{Aeq} , these activities will comply.

This shows that all noise sources will be below the criterion (AS2107) in the bedrooms of the adjacent neighbours to the north with windows open, except for goods delivery and waste removal. We recommend that the times for either of these activities be limited to 7 am to 6 pm Monday to Saturday, and not on Sundays or public holidays.

5.2. Emissions

5.2.1. Road Traffic Noise - Existing

Road traffic noise predictions were conducted using SoundPlan, incorporating CoRTN based algorithms.

5.2.2. Modelled Road Traffic Noise Levels – Year 2024

The predicted $L_{A10,18hr}$ levels represent an increase in road traffic noise levels, which can be applied to the measured $L_{Aeq,1hr}$ levels to produce predicted 2024 daytime and night time levels, which are applicable to the criterion for assessment of noise impacts inside units.

Noise levels have been assessed to AS 2107 and we have determined that rooms require treatment as per the diagrams Figure 3 and



Figure 7.

5.3. Passenger Terminal Noise

Passenger ships dock at the port on a regular basis. However, investigations show that most of these arrive in the morning and depart the same afternoon or evening. Appendix B shows a schedule downloaded from the Port of Brisbane, and it confirms this. It reveals that there is impacts during the early morning. During the logging period, there were two ships arrive, and noise levels were elevated during this period. We therefore recommend glazing of RW 35 (indicatively 10.38 mm laminated glass) to the bedrooms on the southern and eastern facades to protect the amenity of occupants during the early morning hours.

Time period	Noise level L_{Aeq}
0:00	47
1:00	46
2:00	46
3:00	49
4:00	50
5:00	57
6:00	63
7:00	66
8:00	66
9:00	68
10:00	66
11:00	67
12:00	66
13:00	74
14:00	66
15:00	60
16:00	61
17:00	60
18:00	58
19:00	56
20:00	57
21:00	56
22:00	53
23:00	52

Figure 3: Level 1 with indicative glazing

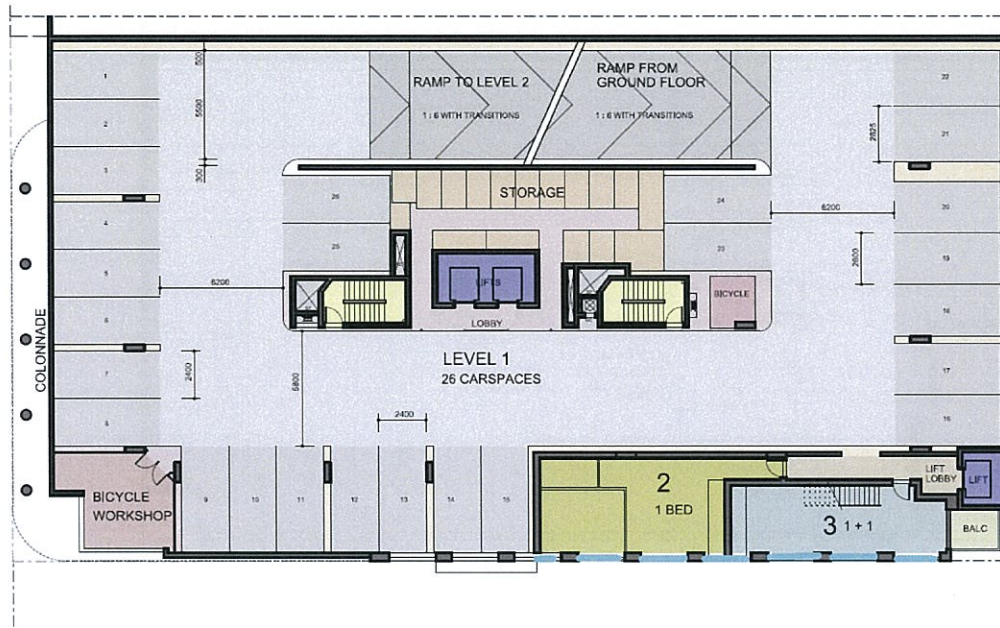


Figure 4: Level 2 with indicative glazing

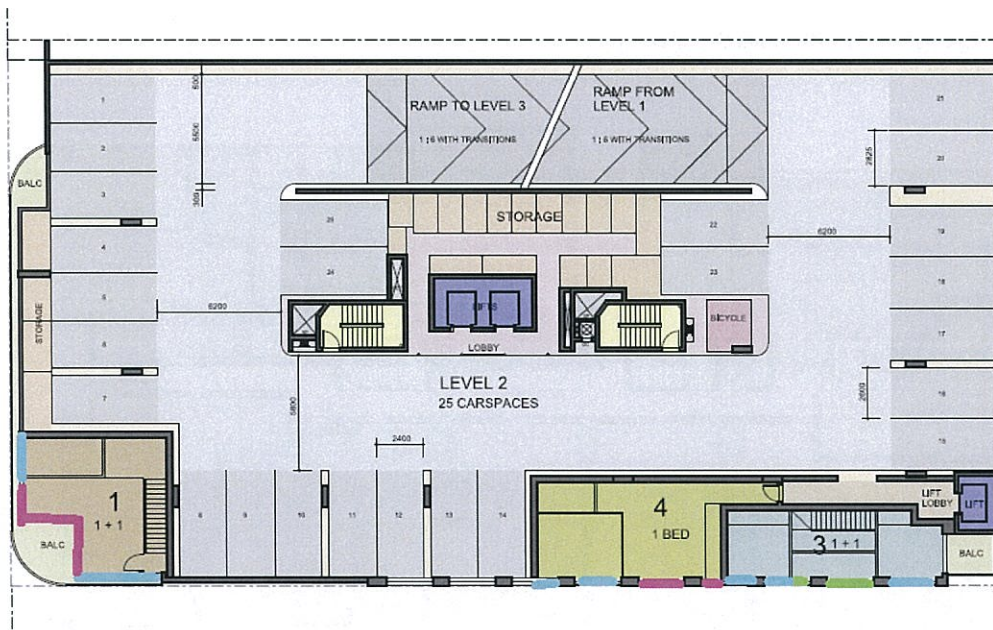
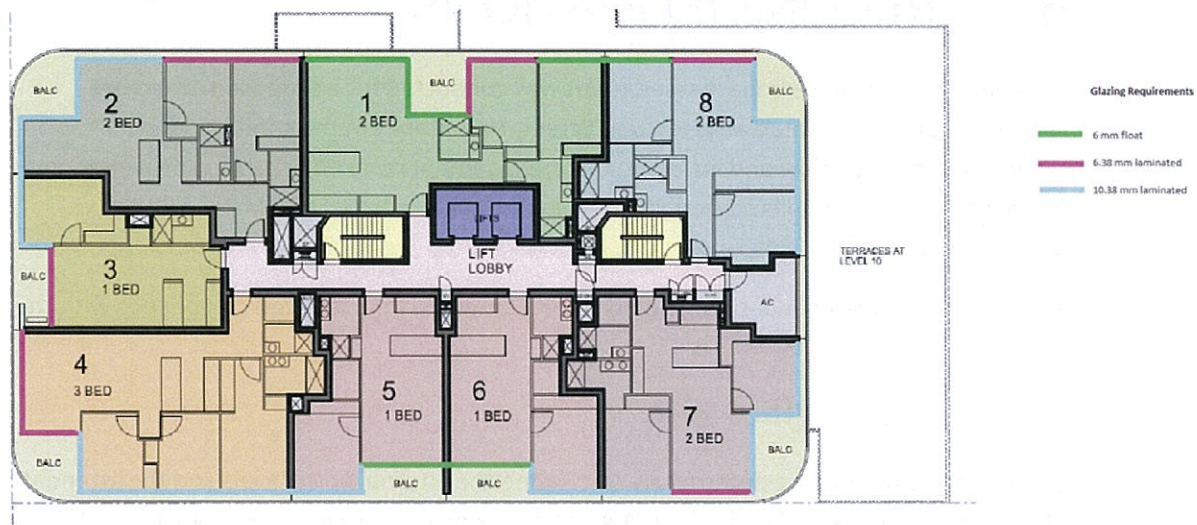


Figure 7: Levels 13 to 19 with indicative glazing



6. RECOMMENDATIONS

An environmental noise impact assessment was conducted for a proposed mixed use residential building located at 5 Hercules Street, Hamilton. On the condition the recommendations below and including the management controls regarding deliveries and waste collection are implemented, the development is predicted to comply with the assessment criteria.

The following recommendations should be implemented for predicted compliance with the criteria:

6.1. Road Traffic Noise

Building treatments were determined calculating the internal noise levels and the attenuation of building elements outlined in Bies D.A., and Hanson C.H., *Engineering Noise Control, Theory and Practice*, Third Edition, 2003, Spon Press, NY, p. 342, formula (8.16) which takes into account internal noise levels, acoustic environment as well as attenuation through the fabric of the building.

Glazing treatments are outlined in Figure 3 to Figure 7 and are indicative glazing only as there may be other alternatives. The specification is for the entire system including frames and mounting hardware.

6.2. Delivery and Waste Removal

Deliveries and waste removal should only be performed during the daytime period Monday to Friday 7 am to 6 pm, and Saturday 8 am to 6 pm, and not on Sunday or public holidays.

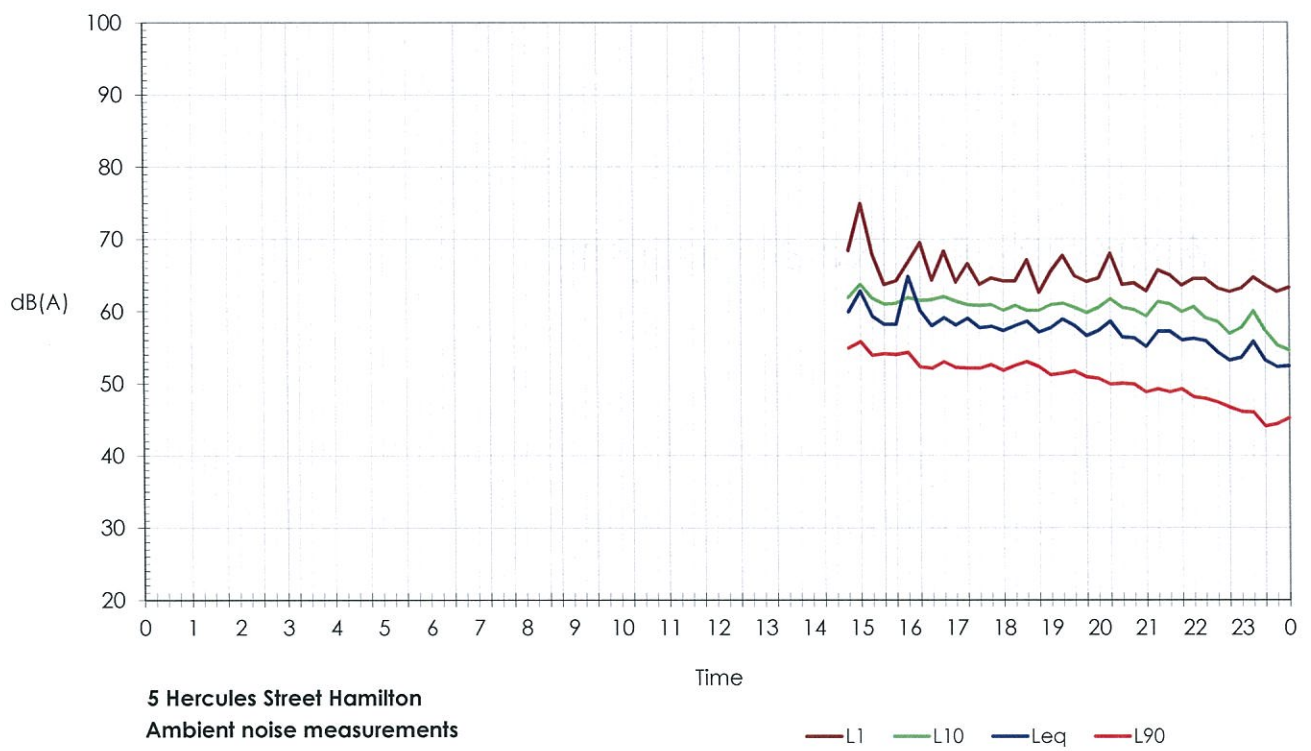
6.2.1. Mechanical Plant Noise Impacts to Offsite Residential Receivers

Because detailed plant selections are not available at this stage, it is not possible to carry out a detailed examination of the ameliorative measures that may be required to achieve the noise targets.

A mechanical plant noise assessment should be conducted by a suitably qualified acoustic consultant once plant selections are finalised. Noise levels should be designed to achieve compliance with the criteria outlined in Section 3. Compliance tests should be conducted after the equipment is installed to ensure compliance with the criteria. Such measures should also be conditioned in the Development Approval.

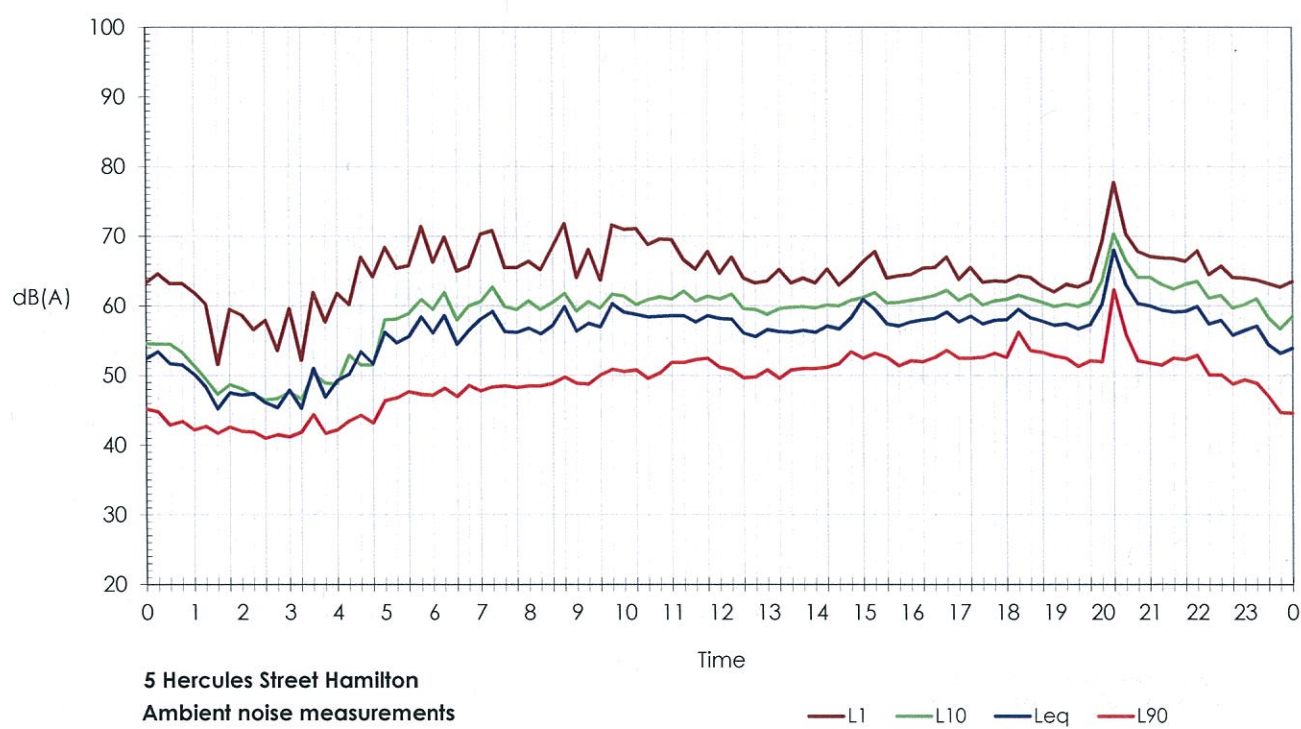
Appendix A Noise Logging

Friday 22 November, 2013



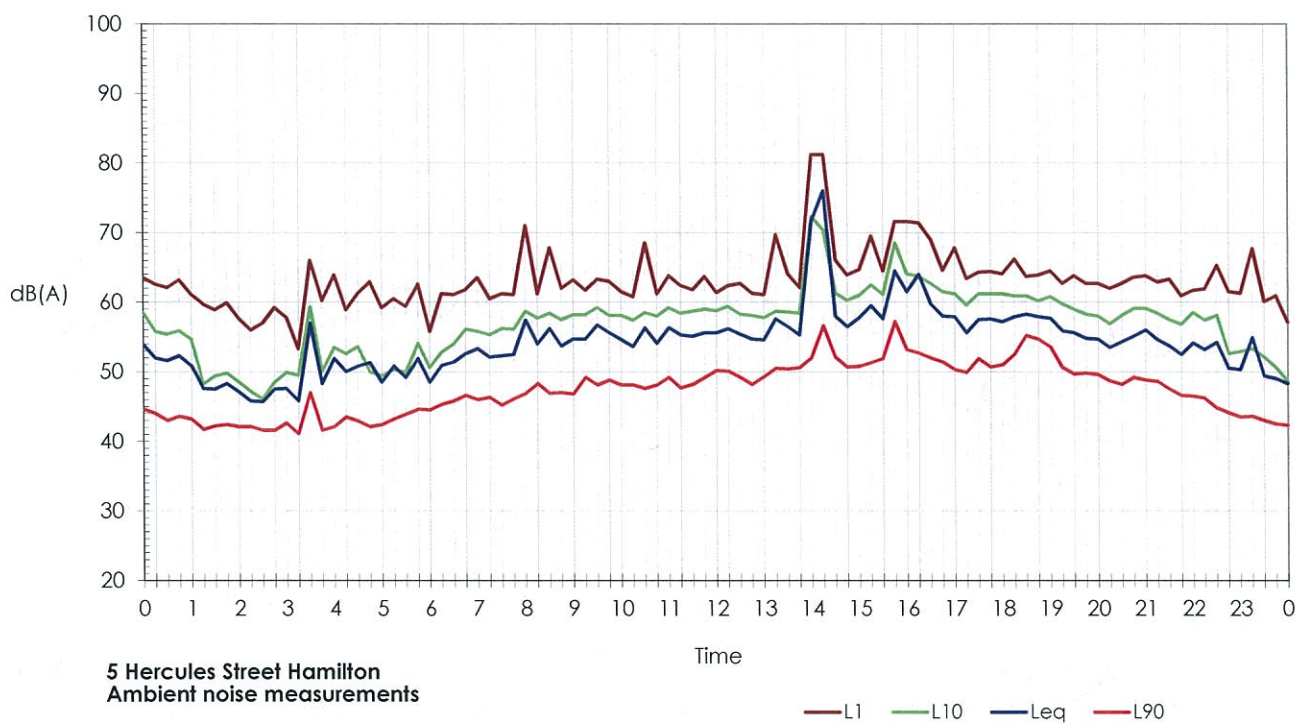
logging calc_8 ARL

Saturday 23 November, 2013



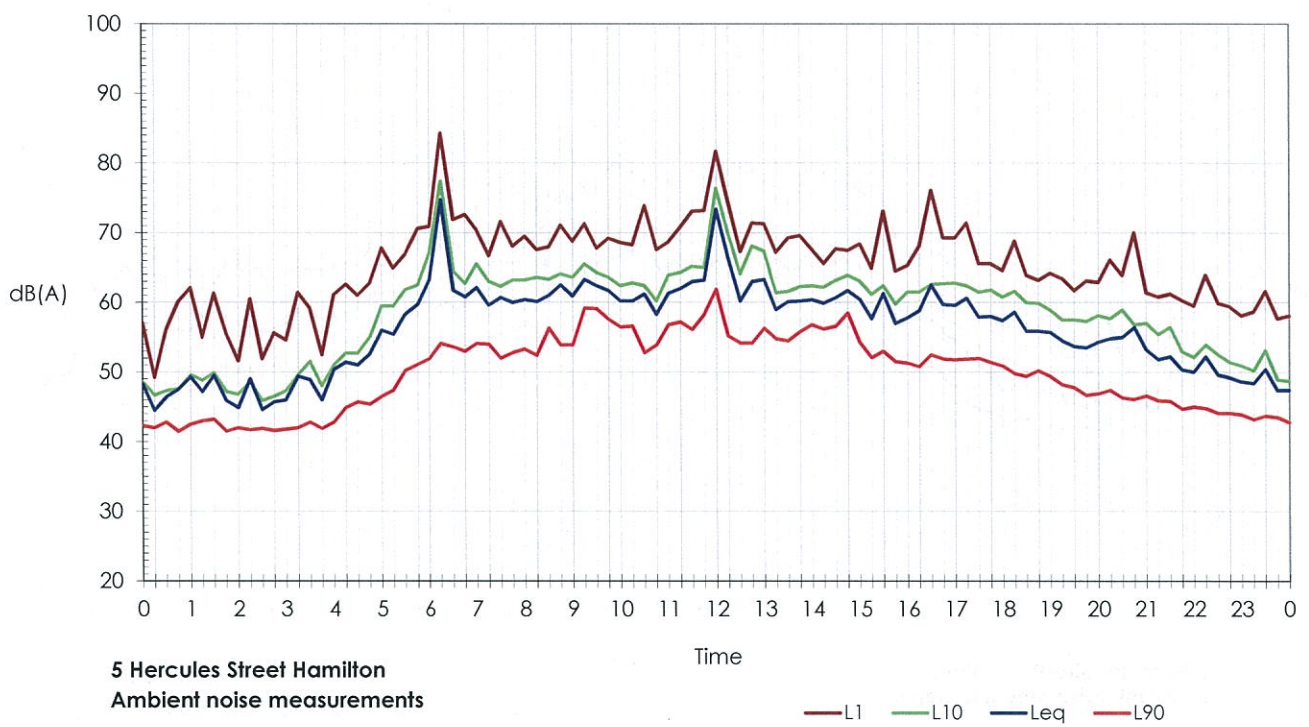
logging calc_8 ARL

Sunday 24 November, 2013



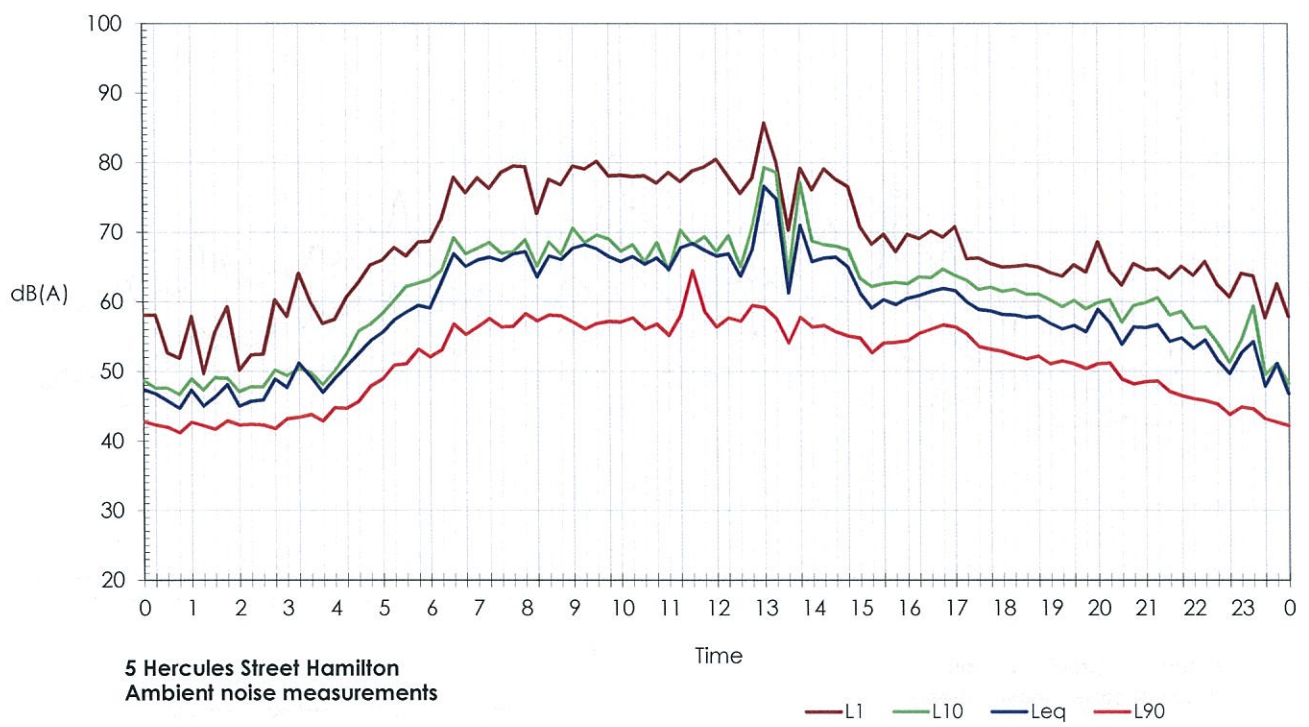
logging calc_8 ARL

Monday 25 November, 2013



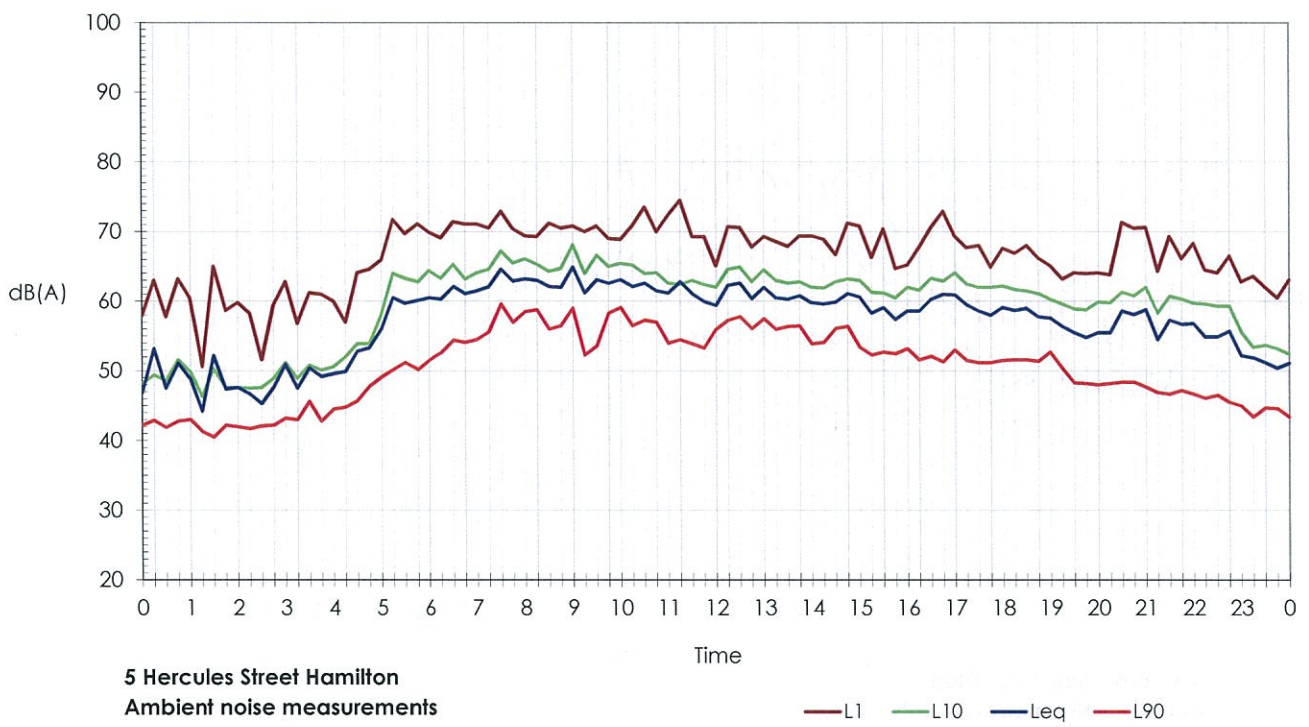
logging calc_8 ARL

Tuesday 26 November, 2013



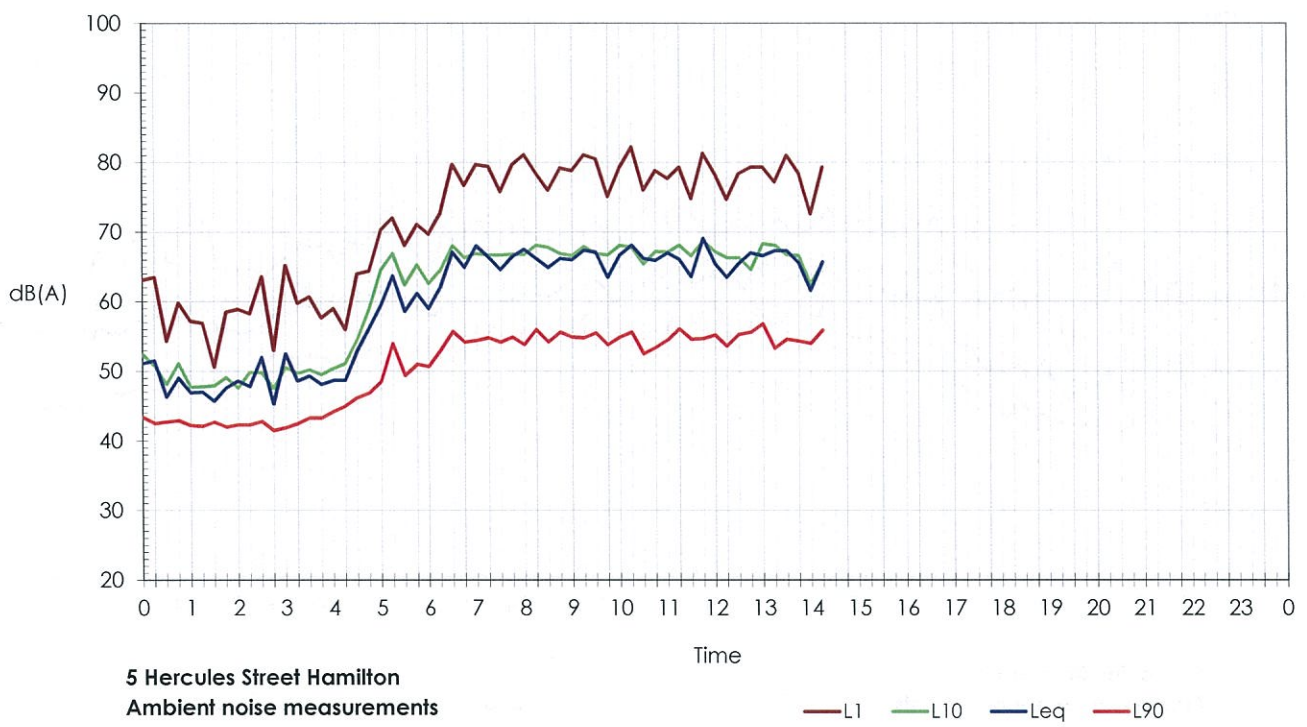
logging calc_8 ARL

Wednesday 27 November, 2013



logging calc_8 ARL

Thursday 28 November, 2013



Appendix B Cruise Ship Schedule

Cruise Liner Schedule: 2014

Name	ETA	ETD	LOA	Agent	Wharf
Seven Seas Voyager	05 January 2014 1000hrs	05 January 2014 2000hrs	206.57	ICS	Portside
Sea Princess	08 January 2014 0630hrs	08 January 2014 1600hrs	261	ISS	Portside
Pacific Dawn	11 January 2014 0530hrs	11 January 2014 1400hrs	245	ISS	Portside
Rhapsody of the Seas	14 January 2014 0800hrs	14 January 2014 1700hrs	279	ICS	FI Grain
Pacific Dawn	18 January 2014 0530hrs	18 January 2014 1400hrs	245	ISS	Portside
Sea Princess	22 January 2014 0630hrs	22 January 2014 1600hrs	261	ISS	Portside
Radiance of the Seas	25 January 2014 0800hrs	25 January 2014 1800hrs	293.20	ICS	FI Grain
Pacific Dawn	25 January 2014 0530hrs	25 January 2014 1600hrs	245	ISS	Portside
Pacific Dawn	28 January 2014 0530hrs	28 January 2014 1600hrs	245	ISS	Portside
Pacific Dawn	01 February 2014 0530hrs	01 February 2014 1400hrs	245	ISS	Portside
Sea Princess	02 February 2014 0630hrs	02 February 2014 1600hrs	261	ISS	Portside
Seven Seas Voyager	03 February 2014 1000hrs	03 February 2014 2000hrs	206.57	ICS	Portside
Columbus 2	07 February 2014 0800hrs	07 February 2014 1800hrs	180.45	GAC	Portside
Pacific Dawn	08 February 2014 0530hrs	08 February 2014 1400hrs	245	ISS	Portside
Silver Whisper	08 February 2014 0800hrs	08 February 2014 1900hrs	186	ISS	FI Grain
Astor	13 February 2014 1000hrs	13 February 2014 1900hrs	176	ISS	Portside
Amsterdam	14 February 2014 0800hrs	14 February 2014 1800hrs	238	ISS	Portside
Pacific Dawn	15 February 2014 0530hrs	15 February 2014 1400hrs	245	ISS	Portside
Artania	15 February 2014 0800hrs	15 February 2014 1800hrs	230	ISS	FI Grain
Sea Princess	16 February 2014 0630hrs	16 February 2014 1600hrs	261	ISS	Portside
Aurora	18 February 2014 0700hrs	18 February 2014 1600hrs	270	ISS	FI Grain