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Discovery Point Stage 1

Project Application

Acoustic and Vibration Assessment

Report Number 610.10078

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Discovery Point Pty Ltd
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Discovery Point Stage 1

Project Application

Acoustic and Vibration Assessment

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1 INTRODUCTION

This report follows an acoustic and vibration report (dated 17 June 2010) that formed part of the Environment Assessment (EA) in relation to the preparation of the Concept Plan.

The purpose of this report is to establish the potential noise impacts both on and from the proposed development and to propose conceptual measures to deal with these.

This report addresses planning provisions applying to the site, in relation to:

- The NSW Department of Planning "Development Near Rail Corridors and Busy Roads - Interim Guideline";
- AS 2021–200 Acoustics – Aircraft noise intrusion – Building siting and construction;
- The NSW Industrial Noise Policy; and
- Outlines how noise will be managed and ameliorated through the design of the proposed Discovery Point, Stage 1 development.

The results of environmental noise logging (conducted during the preparation of the Concept Plan) are presented, together with environmental (external) noise criteria for the development's emissions and relevant information to enable the report to support the Part 3A /DA submission.

1.1 The Proposed Works

The proposed works consists of the following key elements:

It has the following key components:

1A – Neighbourhood Park

- Permanent deep soil park (approximately 2000m^2 Standard Instrument GFA)
- Temporary park on suspended slab (approximately 1500m^2)

1B – Supermarket Building

- Small supermarket (approximately 1200m^2)
- Specialty retail (approximately 100m^2) and temporary loading dock
- One level of basement car parking
- One level of above ground parking & residential (approximately six apartments)
- Podium park with community facilities above residential level

1C – Residential Tower 1

- Specialty retail (approximately 650m^2)
- 13 levels of residential (approximately 9000m^2)
- Two levels of basement car parking
- Two levels of basement sewer recycling tanks and equipment
- Roof garden above top residential level

2 SITE LOCATION

Discovery Point is a mixed use development site located at 1 Princes Highway, Wolli Creek. The Discovery Point Concept Plan area is bound by Princes Highway, Cook's River, Illawarra Railway Line, Magdalene Terrace and Brodie Spark Drive. Stage 1 is located within the southern precinct of Discovery Point, to the south of Wolli Creek Railway Station.

The key component of Stage 1 is Building 1C, a 14-storey mixed-use building, located approximately 45m to the south of Wolli Creek Station (Airport Railway Line), and approximately 65m to the east of Illawarra Railway Line and approximately 170m west of The Princes Highway.

Stage 1 also includes Building 1B, a two-storey mixed-use building, approximately 45m to the south of Wolli Creek Station (Airport Railway Line), and approximately 45m to the east of Illawarra Railway Line and approximately 200m west of The Princes Highway.

Figure 1 Site Location Map for the Proposed Buildings

3 POTENTIAL NOISE AND VIBRATION SOURCES

The following noise sources have been considered as potential sources of intrusive noise at the site:

- Rail traffic on the Illawarra Line and on the Airport Line
- Road traffic on Princes Highway
- Aircraft

Potential noise associated with the development may include:

- Air-conditioning plant (cooling towers, condensers, air handling units)
- Ventilation plant (carpark, toilet and kitchen exhaust systems)
- Parking and vehicle movements

4 SENSITIVE RECEIVERS

The nearest sensitive receivers are those dwellings in the Verge apartments, which are part of the overall Discovery Point development itself.

Meeting the noise emission criteria at the Verge apartments will guarantee compliance at the nearest, (and yet to be constructed) building proposed in the Concept Plan (Building 2) and the more distant existing apartment buildings on the south side of Magdelene Terrace.

5 NOISE AND VIBRATION CRITERIA

5.1 Railway Noise

Noise (and vibration) assessments should be undertaken in accordance with the requirement of NSW Department of Planning (DoP) *"Development Near Rail Corridors and Busy Roads - Interim Guideline*" (herein after referred to as the "*Interim Guideline*").

The *Interim Guideline* provides criteria for the internal noise levels due to rail (and road) traffic within single dwelling and multi-unit residential buildings, as presented in **Table 1**.

The criteria apply separately to rail and road noise sources.

Table 1 Rail (and Road) Noise Assessment Criteria

Internal Space	Applicable Time Period	Internal noise level [2] (Windows closed guideline)
Sleeping areas (bedroom)	Night (10.00 pm to 7.00 am)	35 dBA
Other habitable rooms [1]	At any time	40 dBA

Note 1: Excluding garages, [stand alone] kitchens, bathrooms and hallways.

Note 2: Airborne noise is calculated as Leq (9h) (night) and Leq (15h)(day). Groundborne noise is calculated as Lmax (slow) for 95% of rail pass-by events.

The document also states:

> "*If internal noise levels with windows or doors open exceed the criteria by more than 10 dBA, 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*".

5.2 Railway Vibration

The NSW Department of Planning (DoP) *Interim Guideline* requires that vibration levels such as the intermittent vibration emitted by trains should comply with the criteria in *Assessing Vibration: a technical guideline* (DECC 2006, now DECCW).

In turn, the DoP "*Assessing Vibration"* guideline requires the vibration dose value (VDV) be used when assessing intermittent vibration.

The VDV accumulates the vibration energy received over the daytime and night-time periods. Acceptable values of vibration dose are presented in **Table 2**.

Table 2 Acceptable Vibration Dose Values for Intermittent Vibration (m/s$^{1.75}$)

Location	Daytime (7.00 am – 10.00 pm)		Night-time (10.00 pm – 7.00 am)	
	Preferred Value	**Maximum Value**	**Preferred Value**	**Maximum Value**
Critical areas [1]	0.1	0.2	0.10	0.20
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Note 1 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas

5.2.1 Groundborne Railway Noise

The *Interim Guideline* provides requires that residential buildings be designed so that the 95th percentile of train pass-bys complies with a groundborne L_{Amax} noise limit of 40 dBA (daytime) or 35 dBA (night-time). These criteria are presented in **Table 1**, **Section 5.1**.

5.3 Road Traffic Noise (Incident on Building)

The *Interim Guideline* provides criteria for the internal noise levels due to road (and rail) traffic within single dwelling and multi-unit residential buildings, as presented in **Table 1**.

The criteria apply separately to road and rail noise sources.

5.4 Aircraft Noise (AS 2021-2000)

Australian Standard 2021-2000 "*Acoustics - Aircraft Noise Intrusion - Building Siting and Construction*" defines the acceptability of a variety of building types and land uses within varying ANEF categories.

A summary of the acceptability of differing building types within various ANEF categories is presented in **Table 3** (as reproduced from AS 2021-2000).

Table 3 Building Site Acceptability Based on ANEF Zones

Building Type	ANEF Zone of Site		
	Acceptable [1]	**Conditionally acceptable [2]**	**Unacceptable [3]**
House, home unit, flat, caravan park	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
Public building	Less than 20 ANEF	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF

Note 1 Acceptable: No need for the building to provide specific protection from aircraft noise.
Note 2 Conditional: Buildings within the ANEF zone which has a conditional status are required to comply with internal noise levels appropriate for the intended use of the space.
Note 3 Unacceptable: Building site classified as unacceptable should not normally be considered.

Buildings 1B and 1C lie between the ANEF 20 and the ANEF 25 contour and, as such (from **Table 3**) aircraft noise intrusion needs to be addressed, in accordance with the requirements of AS2021-2000.

Since the site is classified as "acceptable" for commercial and retail buildings and there is no requirement for building envelopes of commercial and retail buildings to be designed with regard to controlling aircraft noise.

For the purpose of determining an appropriate degree of aircraft noise reduction, AS 2021-2000 gives indoor design sound levels for various building types and activities. These are listed in **Table 4** for private residences.

Table 4 Indoor Design Sound Levels for "homes, home units, flats, caravan parks"

Area /Activity	Indoor Design Sound Level, dBA
Sleeping areas, dedicated lounges	50
Other habitable spaces	55
Bathrooms, toilets, laundries	60

5.5 Noise Emissions

The *industrial*-type noise emissions from the development (ie, noise associated with the development such as mechanical services systems and loading dock activity) must be controlled to protect the acoustic amenity of the residences within, and close to, the development, in accordance with the NSW DECCW's *Industrial Noise Policy* (INP).

Area Classification

We consider this site to fall under the "Urban Area" classification. The INP characterises an Urban Area as an area with an acoustical environment that:

- is dominated by "urban hum" or industrial source noise - where urban hum means the aggregate sound of many unidentifiable, mostly traffic-related sound sources.
- has through traffic with characteristically heavy and continuous traffic flows during peak periods
- is near commercial districts or industrial districts
- has any combination of the above

The former two categories apply to this site.

Project Specific Noise Levels

The *project specific noise levels* are determined from the lower of the Intrusive and Amenity criteria (**Appendix A** refers) for each period and are shown in **Table 5**.

Since the criteria are also determined from the lesser of the noise levels measured at each of the measurement locations (**Appendix A** refers) it may be beneficial to undertake further noise logging, at some later stage, to take account of potential shielding from the completion of the "Vine" building.

Table 5 Criteria for Mechanical Noise Emissions to Nearby Residences

Time of Day	Noise Level dBA re 20 µPa
	Limiting Criteria
Day	52 dBA (11 hour)
Evening	48 dBA (4 hour)
Night	43 dBA (9 hour)

Where mechanical plant will operate 24 hours a day, controlling the noise during the night period will be the over-riding criterion. Controlling noise to the night-time criterion of 43 dBA will ensure compliance at all other times.

5.6 Road Traffic Noise (Impact on the Environment)

The NSW DECCW's *"Environmental Criteria for Road Traffic Noise"* (ECRTN, May 1999) sets noise goals for road traffic noise. The policy document provides road traffic noise criteria for proposed road or commercial land use developments as well as noise goals for other sensitive land uses. The relevant criteria relating to land use developments with potential to create additional traffic on "*existing arterial roads"* roads is summarised in **Table 6**.

Table 6 ECRTN Guidelines for Road Traffic Noise at Residences

Type of Development	Criteria		
	Day (7am to 10pm)	**Night (10pm to 7am)**	**Where Criteria are Already Exceeded**
Land use developments with potential to create additional traffic on existing freeways /arterials	$L_{Aeq(15hr)}$ 60 dBA	$L_{Aeq(9hr)}$ 55 dBA	Where feasible, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

Definitions: Land use development with potential to create additional traffic on existing roads implies increases to the magnitude of the traffic flow and/or changes to the traffic mix brought about by new land use developments or significant alterations to existing land use developments, which may not involve any construction to the road. This category does not cover minor changes that are not subject to either development consent or amendment to an EPA licence.

From the measured noise levels in the middle of the site (Location 2, **Table 9**, **Appendix A** refers), it is clear that road traffic levels at existing residences close to the Highway will exceed the criteria given in **Table 6** above. Thus, the over-riding criterion becomes that traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

5.7 Internal Acoustic Separation

The internal acoustic isolation requirements must, as a minimum, comply with those of the Building Code of Australia (BCA).

The development may adopt a higher standard than this, according to the project's quality aims.

6 ASSESSMENT AND RECOMMENDATIONS

6.1 Railway Noise

Section 3.5.1 "Rail Corridors" of the *Interim Guideline*, provides a guide as to the level of assessment required when noise sensitive developments are located in the vicinity of existing rail lines, as follows.

For tracks carrying passenger services running at speeds greater than or equal to 80km/hour, the Interim Guide assigns a "Zone B assessment" for distances of between 25m and 60m from the operational track.

The Interim Guide also assigns a "Zone B assessment" for tracks carrying freight services running at speeds up to 80km/hour for distances of between 25m and 60m from the operational track. (Freight services within the Sydney metropolitan area are limited to less than 80km/hour.)

The closest part of Building 1B from the Illawarra and Airport Lines is approximately 45m (from both Lines). The closest part of Building 1C from either Lines is approximately 48m (from the Airport Line). Both buildings therefore fall into the Zone B category.

The Interim Guide's Zone B standard mitigation measures are consistent with Road Noise Control Treatment "Category 2", which are not onerous – for example: minimum 6mm monolithic glass and full perimeter acoustic seals for openable windows.

However, the need to control aircraft noise will require higher performance glazing (**Section 6.4** refers). Thus, the control of airborne rail noise will be addressed by the higher specification.

It may also be possible to include potential shielding that Building 1B will receive from Building 4 and Building 14, when the latter are built.

6.2 Railway Vibration

The *Interim Guideline* refers to a "vibration assessment zone" for typical development sites adjacent to rail corridors or above rail tunnels as being up to 25m (from the nearest operational track) for residential buildings on "hard" ground, such as sandstone, but that "the assessment zone may need to be increased for specific areas where vibration issues are known to already exist".

In this case, since the closest part of Building 1B is approximately 45m from both the Illawarra Railway Line and the Airport Railway Line, a vibration assessment is not required. Building 1C is further from both lines and, therefore, an assessment is not required.

6.2.1 Groundborne Railway Noise

For buildings located above railway tunnels, it is normally the "groundborne" or "regenerated" noise (a secondary effect of the vibration) that provides the limiting case for design rather than the tactile vibration, itself. This noise is initially propagated as vibration through the ground and building structure, and is then radiated as noise from vibrating building elements, such as walls and floors. It is also sometimes referred to as structureborne noise.

Illawarra Line

Predicted groundborne noise levels from vibration measurements of passenger and freight train pass-bys at a point approximately 14m from the Illawarra Line ranged from 7 dBA to 27 dBA, and 14 dBA to 21 dBA, respectively. (Our report reference 10-8765-R1 "*Proposed Retail Development, Discovery Point, Acoustic & Vibration Assessment*" dated 17 June 2010, refers.)

Since the residential component of Building 1B is approximately 45m from the Illawarra Line (and Building 1C is approximately 65m) the groundborne noise can be expected to be well below the 35 dBA night-time criterion. As such the Buildings 1B and 1C are unlikely to require isolation from the Illawarra Railway Line. If some isolation is required, this will be developed during the detail design stage.

Airport Line

Predicted groundborne noise levels from vibration measurements of passenger train pass-bys at a point approximately 5m from the Airport Line were in the order of 35 dB – ie equal to the 35 dBA night-time criterion.

Since Buildings 1B and 1C are approximately 45m and 48m respectively from the Airport Line, the groundborne noise can be expected to be well below the 35 dBA night-time criterion. As such the Buildings 1B and 1C are unlikely to require isolation from the Airport Line. As for the Illawarra Line, if some isolation is required, this will be developed during the detail design stage.

6.3 Road Traffic Noise Intrusion

The most significant road traffic the buildings will be subject to will be from the Princes Highway. The limiting, or governing condition will be the night-time level of 53 $L_{Aeq(9hour)}$, **Table 9, Appendix A** refers.

It is predicted that 6.38 mm laminated glazing will be adequate to achieve the *Interim Guideline* criteria (**Table 1**, **Section 5.2**) for completely glazed facades. The final selection and extent of specific glazing solutions will be developed during the detail design stage.

Assuming a nominal 10 dBA reduction for open windows, the internal levels would satisfy the open-window criteria (essentially 45 dBA bedrooms and 50 dBA for other habitable rooms).

6.4 Aircraft Noise Intrusion

A study of aircraft noise incident on the Stage 1 site was conducted on 21 December 2010 to determine the design source level for departing aircraft movements from east-west and north-south runways – departures on these runways having been found, by the methods dictated by AS 2021-2000, to result in the highest noise levels on the site. (The measurements were taken on the roof of the adjacent Verge building and can be applied to Buildings 1B and 1C.)

The measured levels ranged from 69 dBA to 75 dBA ($L_{Amax,slow}$) for the north-south runway (34L) and from 63 dBA to 70 dBA for the east-west runway (25).

The median value for the nine departures from runway 34L was 72dBA and this value has been adopted as the design noise source level and appropriate glazing to achieve the required internal criteria (**Section 5.4**) has been determined.

Calculations show that 6.38mm laminated glazing will be appropriate for rooms where the majority of the façade is glazed. For rooms with small windows, lower specification glazing may be adequate.

6.5 External Noise Emissions (INP)

Once occupied, the potential for noise impacts from the proposed development on the surrounding (existing and future) community could arise from the following:

- Air-conditioning plant (cooling towers, condensers, air handling units)
- Ventilation plant (carpark, toilet and kitchen exhaust systems)

Project specific noise levels have been developed, in accordance with the NSW DECCW's INP (**Section 5.5** refers).

The potential impact of noise to the environment must be determined during the design process, as equipment details and operational needs become available. The noise must be controlled to the development's own sensitive receivers as these are closer than "off-site" neighbouring premises.

Given the noise environment is dominated by road traffic noise, it is likely that noise from mechanical services plant can be adequately controlled through conventional means – such as attenuators, acoustic louvres, barriers, enclosures, and the appropriate location and orientation of air inlets /outlets and items of plant – without undue difficulty. The necessary measures will be incorporated into the design of Buildings 1B and 1C, to ensure compliance with the INP emissions criteria.

Given the underground carparking, noise from parking and vehicle movements will not be an issue.

The loading dock to the small supermarket is to be located beneath Buidling 4, with its entrance facing the Illawarra Line, away from Buildings 1B and 1C. As such, this should not adversely affect the proposed scheme.

6.6 Road Traffic Noise (Impact on the Environment)

Traffic arising from the development will not lead to an increase in existing noise levels of more than 2 dB. (**Section 5.6** refers.)

The traffic flow on the roads would need to increase by approximately 60% to result in an increase in noise level of 2 dBA. Given an average annual daily traffic (AADT) volume on the Princes highway of in the order of 60,000, it is clear that even all vehicles using all the carparks in a given hour would not result in an increase in noise level of 2 dBA.

Thus, the proposed development will comply with the road traffic noise criteria.

7 CONCLUSION

An assessment of the potential noise impacts both on and from the proposed development has been made with reference to:

- *Development Near Rail Corridors and Busy Roads - Interim Guideline*
- AS 2021–200 Acoustics – *Aircraft noise intrusion – Building siting and construction*; and
- the NSW *Industrial Noise Policy*

The glazing requirements to control airborne noise from the Illawarra Line are not onerous and will be addressed by the need to control aircraft noise.

The residential buildings (Buildings 1B and 1C) are far enough from the railway lines not to require a detailed vibration assessment. Further, measures to isolate the buildings (to control groundborne railway noise) are unlikely to be required.

Road traffic noise from the Princes Highway will be adequately controlled by up to 6.38 mm laminated glazing for noise sensitive rooms with completely glazed facades. Lower specification glazing may be adequate for rooms with less glazing.

The site falls within the ANEF 20 contour and calculations suggest laminated glazing may be required to control aircraft noise, in certain locations. 6.38mm laminated glazing will be appropriate for sensitive rooms where the majority of the façade is glazed. For rooms with small windows, lower specification glazing may be adequate.

Specific noise control measures will be developed during the design stages, as plant and equipment layout become known, to ensure compliance with the noise criteria. It is anticipated that noise will be adequately controlled through conventional means such as attenuators, acoustic louvres, barriers, enclosures, and the location and orientation of air inlets /outlets and items of plant.

Traffic arising from the development will comply with the relevant road traffic noise criteria.

8 CLOSURE

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR Consulting) with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Discovery Point Pty Ltd; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR Consulting.

SLR Consulting disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

AMBIENT NOISE MONITORING

Introduction

SLR Consulting (then Heggies) was previously engaged (c. June 2010) to undertake an acoustic assessment of the overall site, at the Concept Plan stage.

During that time, unattended environmental noise monitoring was conducted over 7 days from Tuesday 20 April 2010 and 27 April 2010 to establish the ambient noise in the vicinity of the nearest sensitive residential receivers.

Full details are given in our report reference 10-8765-R1 "*Proposed Retail Development, Discovery Point, Acoustic & Vibration Assessment*" dated 17 June 2010.

Noise Monitoring Locations

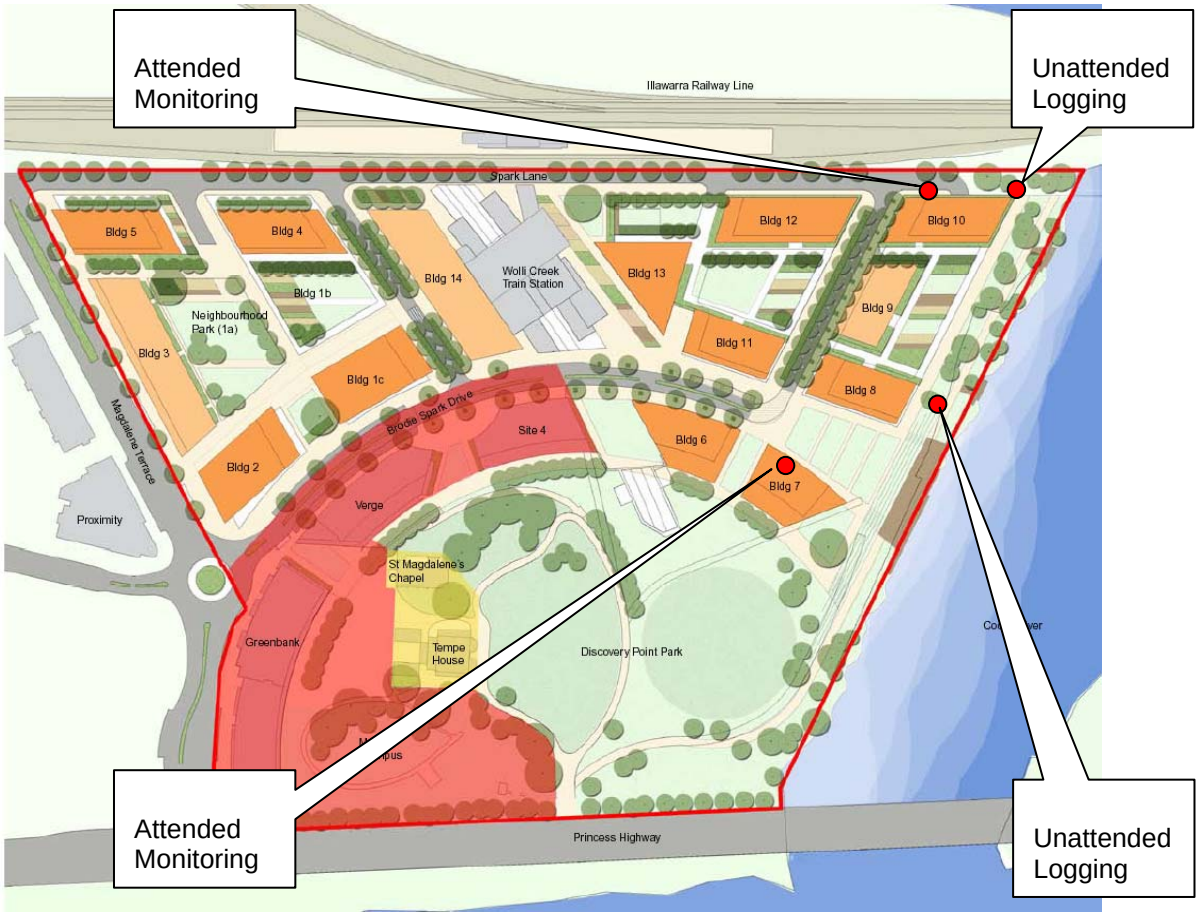
The monitoring locations were selected giving consideration to other noise sources which may influence the readings, the proximity of noise-sensitive locations, security issues for the noise monitoring devices and permission for access from landowners.

The selected monitoring locations are shown in **Figure 2**:

Location 1: On the north-western side of the site to measure ambient noise levels not directly affected by Princes Highway road traffic noise.

Location 2: On the south-eastern side of the site, to measure the ambient noise levels in the vicinity of the Princes Highway – on earth mound, approximately 4m above local ground level.

Figure 2 Noise and Vibration Measurement Locations



Noise Monitoring Results

The noise levels collected over the entire measurement period are summarised in **Figure 3** and **Figure 4**.

The information is presented as a 24 hour period by incorporating median values of the L_{A1}, L_{A10} and L_{A90} together with the logarithmic average of the LAeq levels for the corresponding 15 minute periods of each day.

The major long-term noise at all sites was due to traffic noise from the surrounding road network.

The results of the noise monitoring have been processed in accordance with the procedures contained in the NSW Department of Environment, Climate Change and Water's (DECCW) Industrial Noise Policy (INP) and are presented in **Table 7**.

The Rating Background Level (RBL) has been established. This is the background noise level used for assessment purposes at the nearest potentially affected residence.

While these measurement locations are not in the immediate vicinity of Buildings 1B and 1C, the data obtained can be, and has been, adopted or extrapolated for the buildings – through reference to the relative distances from the respective noise sources.

Figure 3 Measured Noise Levels - Location 1 (Tuesday 20 April to 27 Tuesday April 2010)

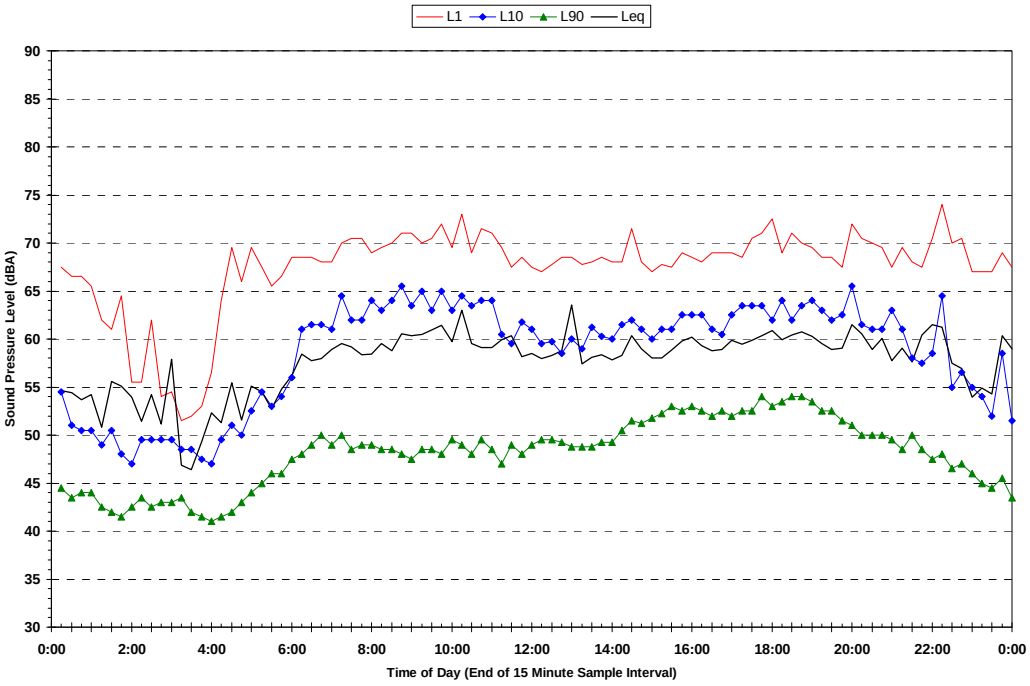


Figure 4 Measured Noise Levels - Location 2 (Tuesday 20 April to 27 Tuesday April 2010)

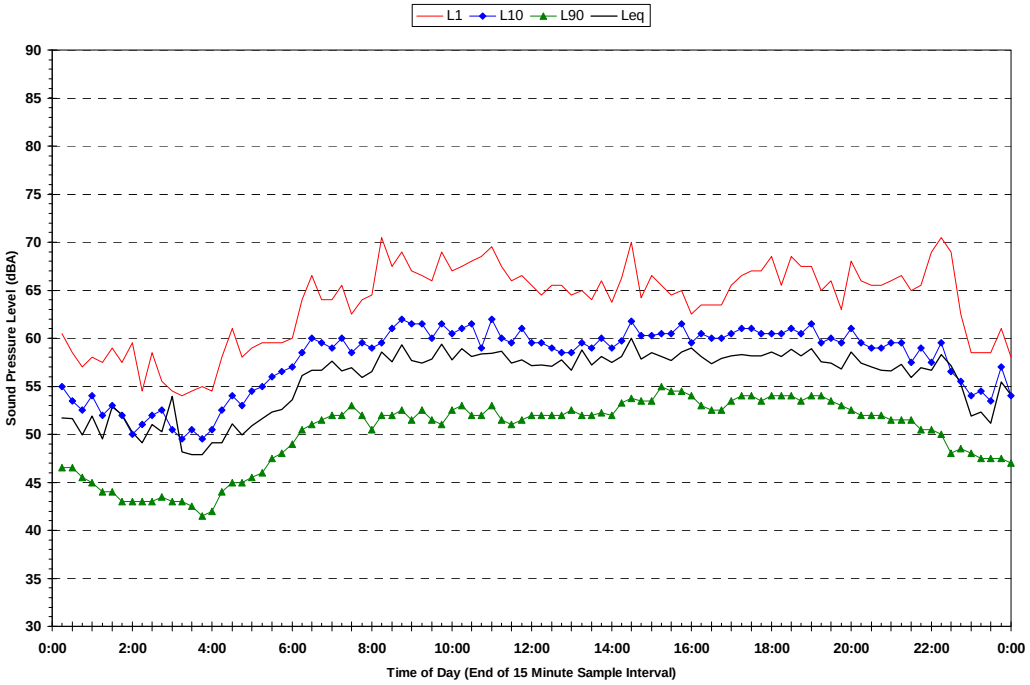


Table 7 Measured Residential Ambient Noise Levels

Logger Location	Noise Level - dBA re 20 µPa					
	Daytime 0700 hrs – 1800 hrs		Evening 1800 hrs - 2200 hrs		Night-time 2200 hrs - 0700 hrs	
	RBL [1]	LAeq [2]	RBL	LAeq	RBL	LAeq
Location 1	48	60	48	60	42	56
Location 2	51	58	51	58	42	53

Note 1: The Rating Background Level (RBL) is representative of the "typical minimum background" sound level. By definition, the RBL is the median of the Assessment Background Level (ABL) which, in turn, is the (lowest) 10th percentile value of the 15 minute background noise level measurements taken over each of the assessment periods. This approach aims to result in the intrusive noise being met for at least 90% of the time periods over which annoyance reactions can occur (taken to be periods of 15 minutes).

Note 2: The L_{Aeq} is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

Note 3: An explanation of the acoustic terminology used is given in **Appendix A**.

Data Processing to Determine Noise Emission Criteria

The noise environment at the site is not controlled by noise from industry – rather, it is primarily due to transportation noise. As such, the project specific noise levels, which are shown in bold in **Table 8**, are the lower of the ANL or intrusive criteria, for each of the assessment periods.

Table 8 Criteria for Mechanical Noise Emissions to Nearby Residences

Location	Time of Day	Noise Level dBA re 20 µPa					
		ANL [1] L_{Aeq} (period)	Measured RBL [2] $L_{A90(15minute)}$	Measured Ambient $L_{Aeq(15minute)}$	Criteria for New Industrial Sources		
					Intrusive $L_{Aeq(15minute)}$	Amenity Criteria [3] $L_{Aeq\ (period)}$	Limiting Criteria [4]
1 – NW, near railway	Day	60	48	60	53	**52**	**52** dBA (11 hour)
	Evening	50	48	60	53	50	50 dBA (4 hour)
	Night	45	42	56	47	46	46 dBA (9 hour)
2 – NE, closer to Princes Highway	Day	60	51	58	56	56	56 dBA (11 hour)
	Evening	50	51	58	56	**48**	**48** dBA (4 hour)
	Night	45	42	53	47	**43**	**43** dBA (9 hour)

Note 1: ANL Acceptable Noise Level for an urban area (**Section 5.5** refers.)
Note 2: RBL Rating Background Level
Note 3: Assuming existing noise levels unlikely to decrease in the future, and assuming no existing industrial noise
Note 4: Project Specific Criteria are shown in bold

The criteria provided in the right-hand column of **Table 8**, are re-presented in the main body of this report in **Table 5**.

Data Processing to Assess Traffic Impact

To assess the likely impact due to any change in traffic noise, the data obtained has been processed in accordance with the DECCW's Environmental Criteria for Road Traffic Noise (ECRTN). Results are presented in **Table 9.**

The values presented are free-field (not façade-reflected) values.

Table 9 Summary of Traffic Noise Indices

Noise Monitoring Location	Main Traffic Noise Indices			
	LAeq(15hour) [1]	LAeq(9hour) [1]	LAeq(1hour) [2] Daytime	LAeq(1hour) [2] Night-time
Location 1 (Illawarra Railway side)	60 dBA	56 dBA	62 dBA	59 dBA
Location 2 (Princes Highway side)	58 dBA	53 dBA	60 dBA	57 dBA

Note 1: $L_{Aeq(period)}$ - In line with the procedures set out in the DECCW's ECRTN, this is LAeq over the entire, respective, assessment period.

Note 2: The (highest) 90-percentile noise level during the defined period.