RODNEY STEVENS ACOUSTICS
Acoustic Consultants
ABN: 78 149 311 455

REPORT 150353R0

Revision 0

Mechanical Plant, Road Traffic and Rail Noise Impact Assessment & Construction Noise Management Plan 2-6 Bold Street & 80-82 Cowper Street Granville NSW

PREPARED FOR:
Mr. Michael Trinh
c/o iDraft Pty Ltd
P. O. Box 427
Merrylands NSW 2160

8 December 2016

T : 02 9943 5057
M : 0418 606 104
F : +61 2 9475 1019
E : info@rodneystevensacoustics.com.au
W : rodneystevensacoustics.com.au

Mechanical Plant, Road Traffic and Rail Noise Impact Assessment & Construction Noise Management Plan 2-6 Bold Street & 80-82 Cowper Street Granville NSW

PREPARED BY:

Rodney Stevens Acoustics Pty Ltd
Telephone: 61 2 9943 5057 Facsimile 61 2 9475 1019
Email: info@rodneystevensacoustics.com.au
Web: www.rodneystevensacoustics.com.au

DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
13114R0	Revision 0	30 June 2014	Desmond Raymond	Raymond Sim	Rodney Stevens
150353R0	Revision 0	31 August 2015	Desmond Raymond	Rodney Stevens	Rodney Stevens
150353R0	Revision 0	8 December 2016	Desmond Raymond	Rodney Stevens	Rodney Stevens

TABLE OF CONTENTS

1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd has been engaged by iDraft Group Pty Ltd to prepare a Road Traffic, Rail Noise and Mechanical Plant Impact Assessment and Construction Noise Management Plan for the proposed mixed use development at 2-6 Bold Street & 80-82 Cowper Street Granville NSW. The proposal is the construction of a thirteen storey mixed use unit development having commercial space and 96 residential units.

This assessment addresses the impact of existing road traffic noise from the Parramatta Road and rail noise from nearby rail corridor adjacent to the proposed mixed development and noise emissions from the proposed development to nearby sensitive receivers and will form part of the Development Application submission to Council.

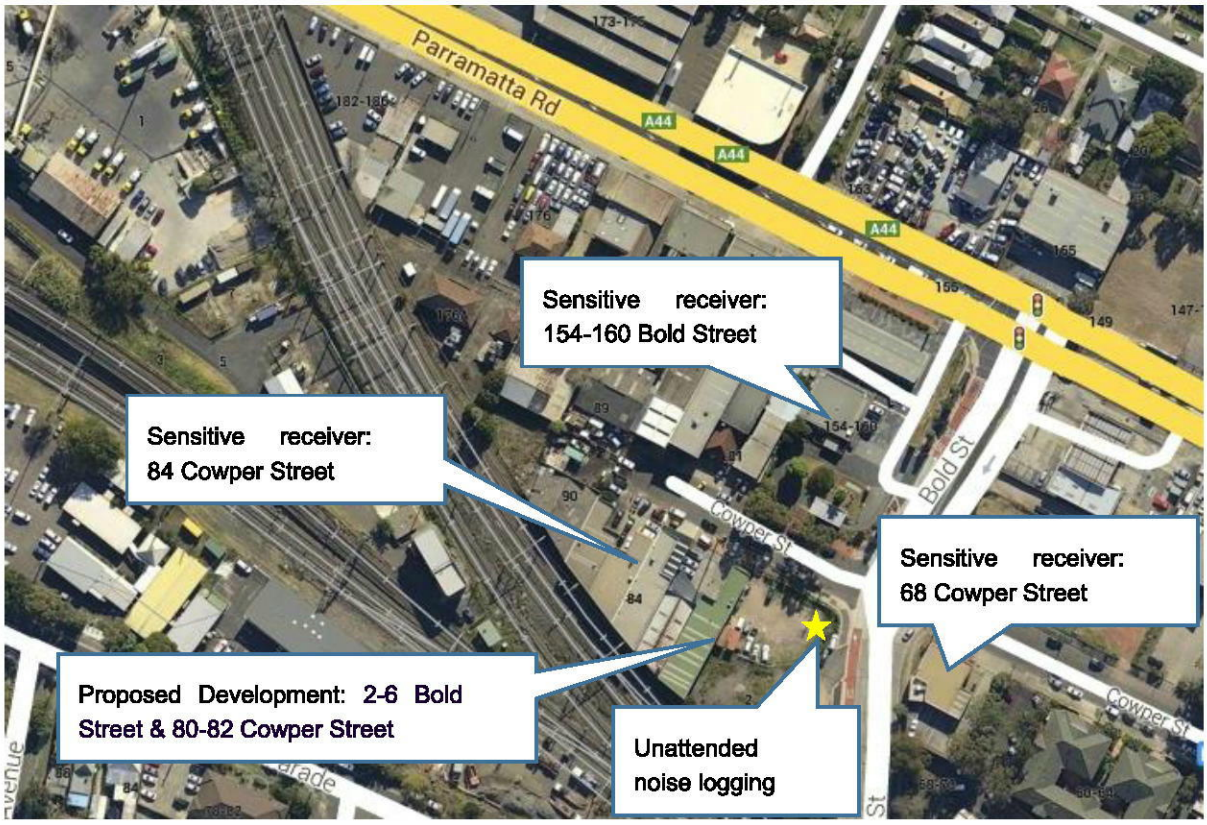
Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix B.

2 PROJECT AREA AND SENSITIVE RECEIVERS

The proposed development site is bounded by Bold Street and Cowper Street. There is an existing commercial development on the western and northern side of the development. The existing rail corridor is located toward the southern side of the development.

The development site and its surrounding environment are mainly influenced by road traffic noise on Parramatta Road and the nearby rail corridor. Figure 2-1 shows an aerial image of the site area and the surrounding environment

Figure 2-1 Project Area and Surrounding Environment Site Plan



The proposed site layouts of the mixed development site are presented in Figure 2-2 to Figure 2-11 below.

Figure 2-2 Basement Level 2 Floor Plan

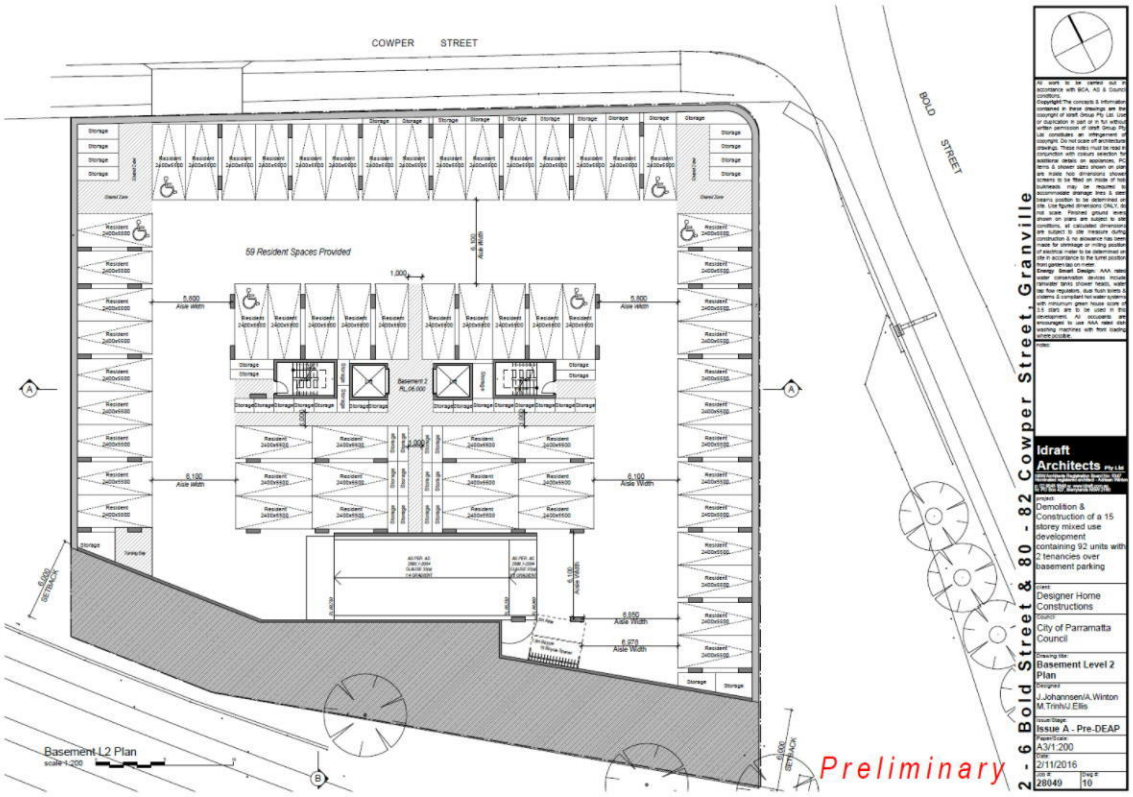


Figure 2-3 Basement Level 1 Floor Plan

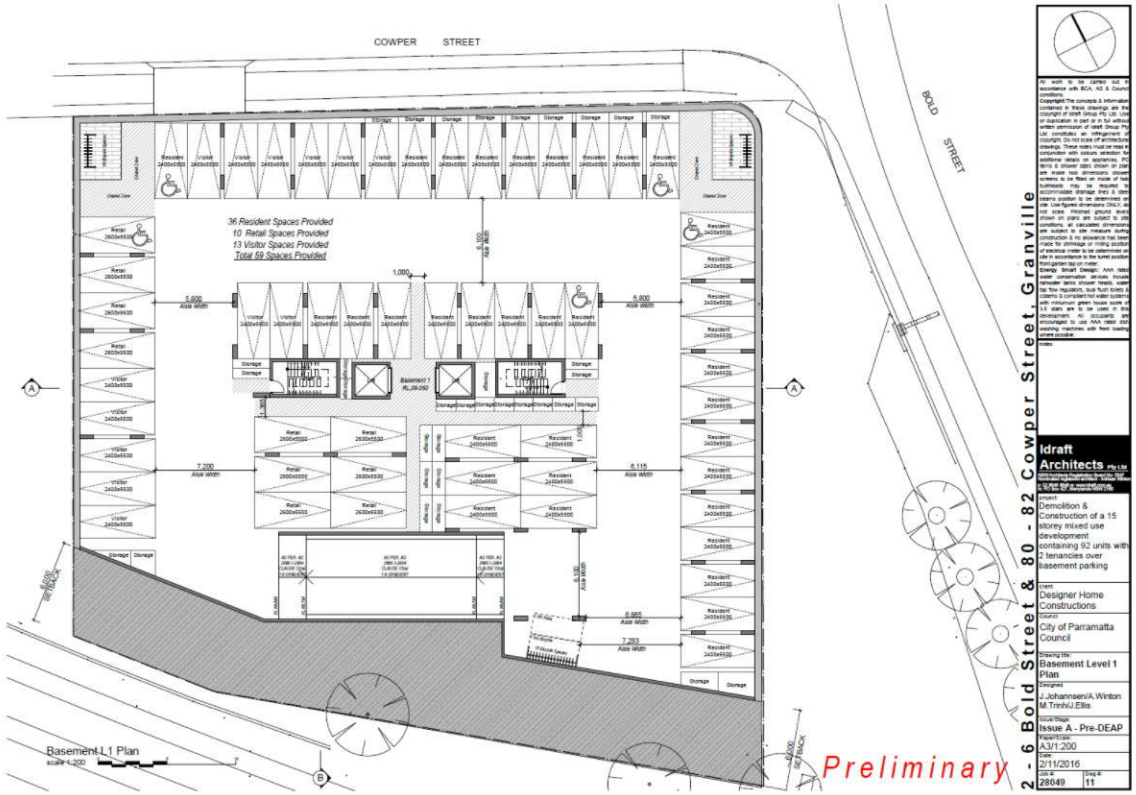


Figure 2-4 Ground Level Floor Plan

Figure 2-5 First Level Floor Plan

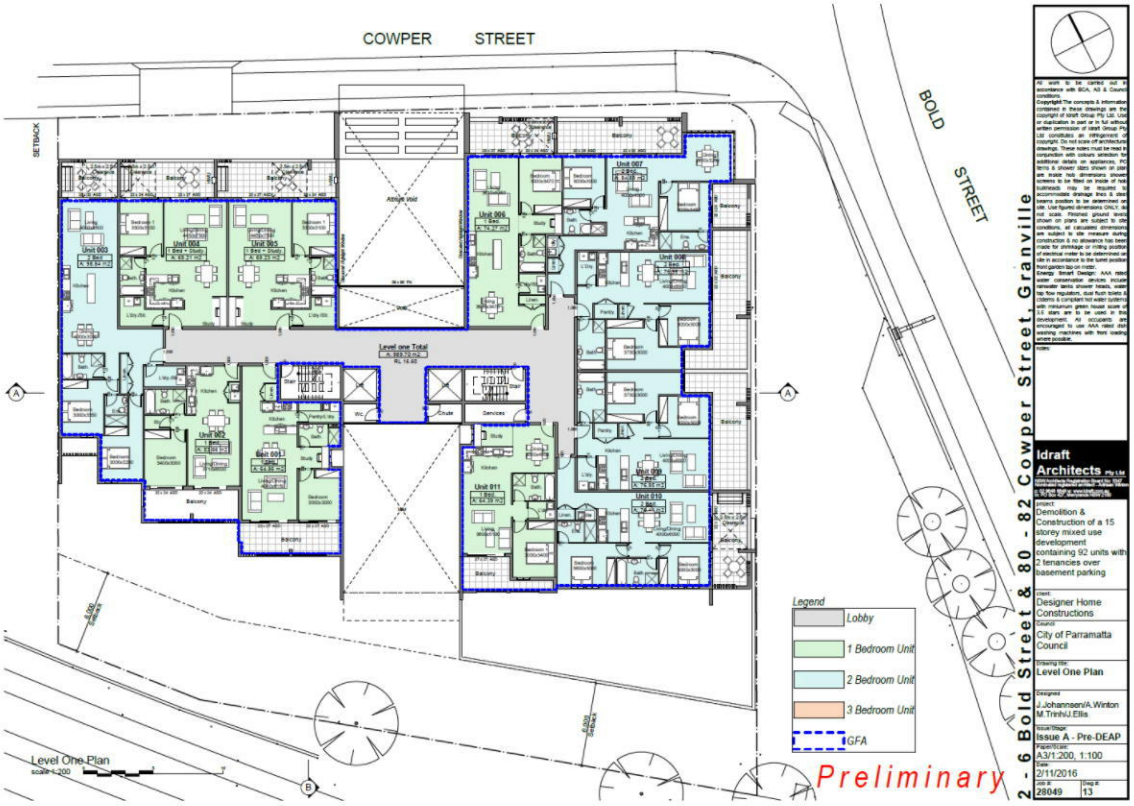


Figure 2-6 Second Level Floor Plan

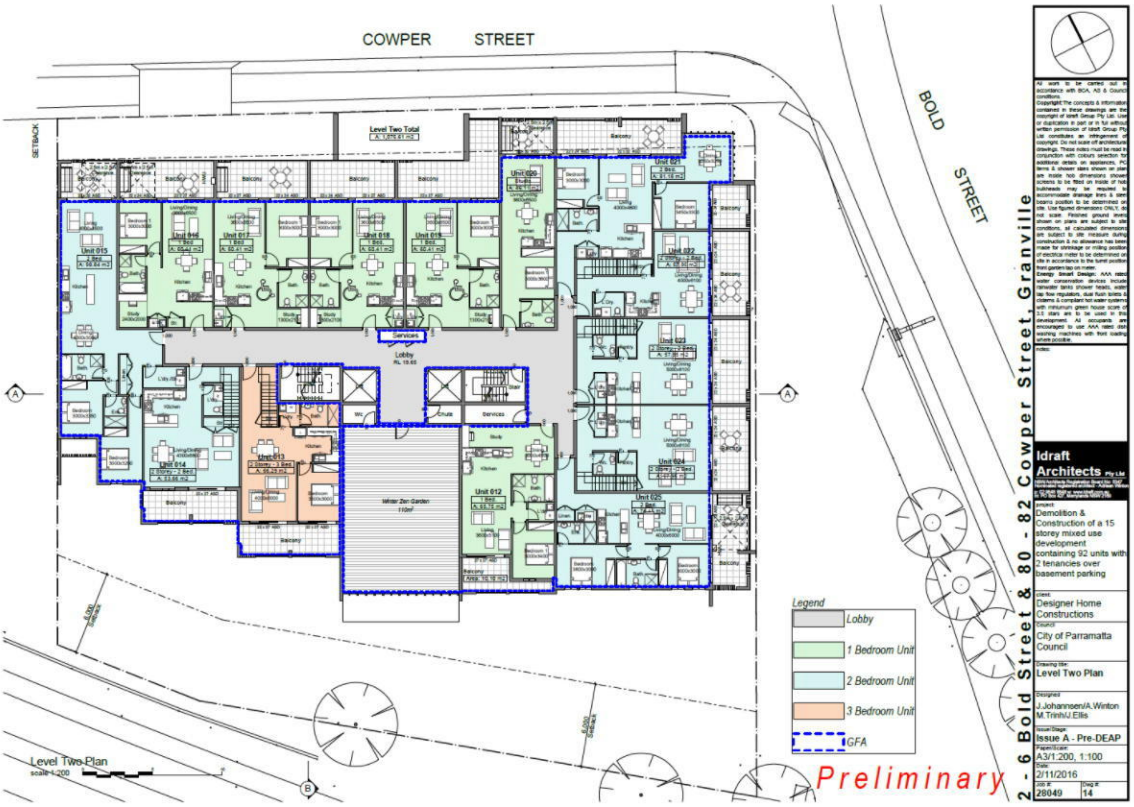


Figure 2-7 Third Level Floor Plan

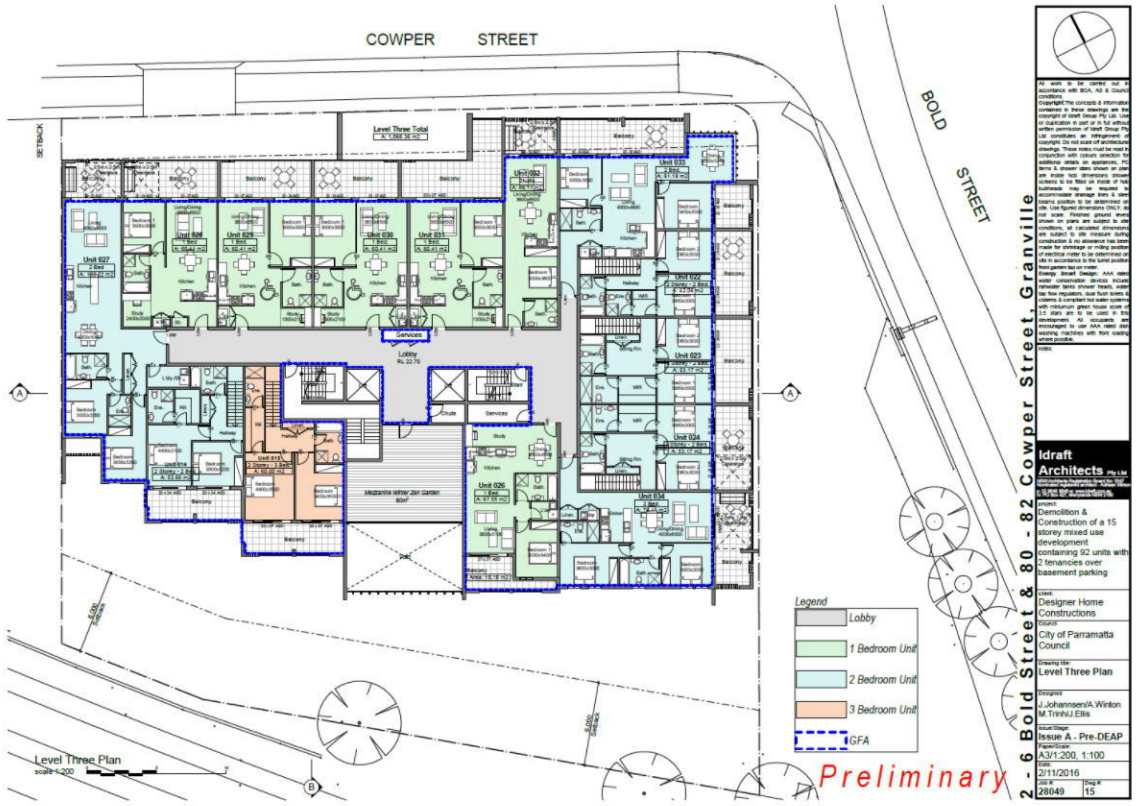


Figure 2-8 Fourth Level Floor Plan

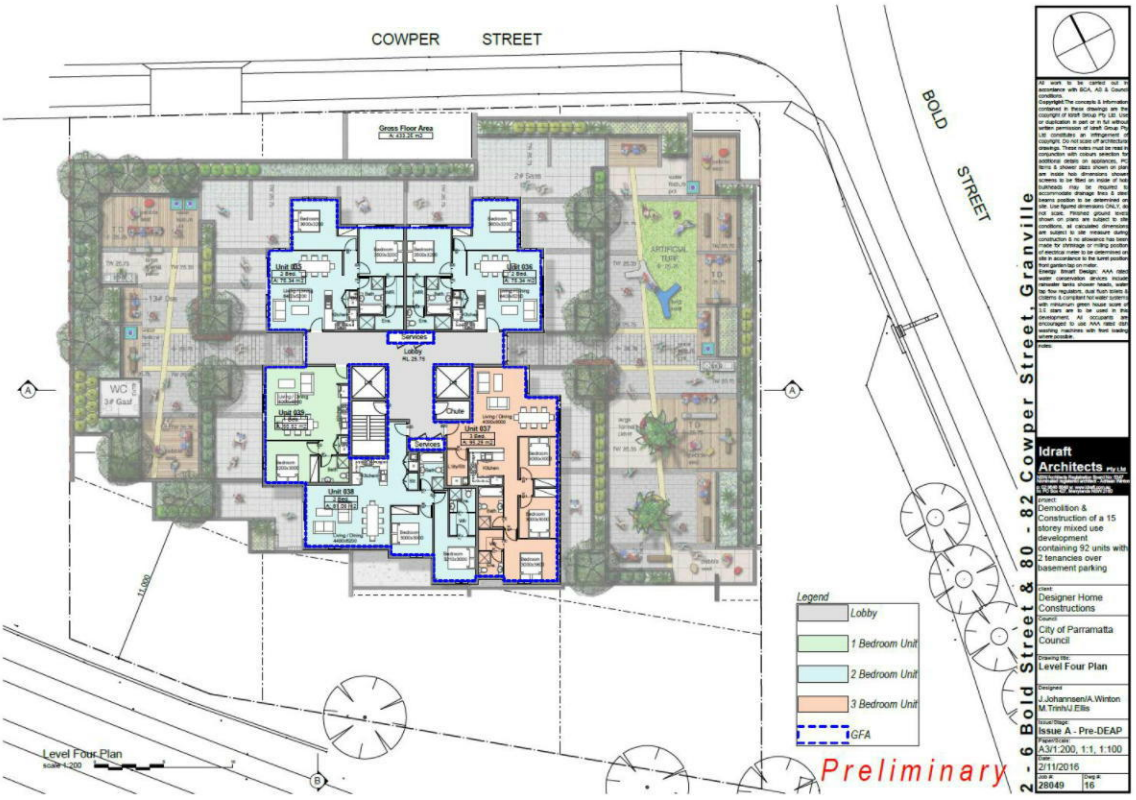


Figure 2-9 Fifth Level Floor Plan

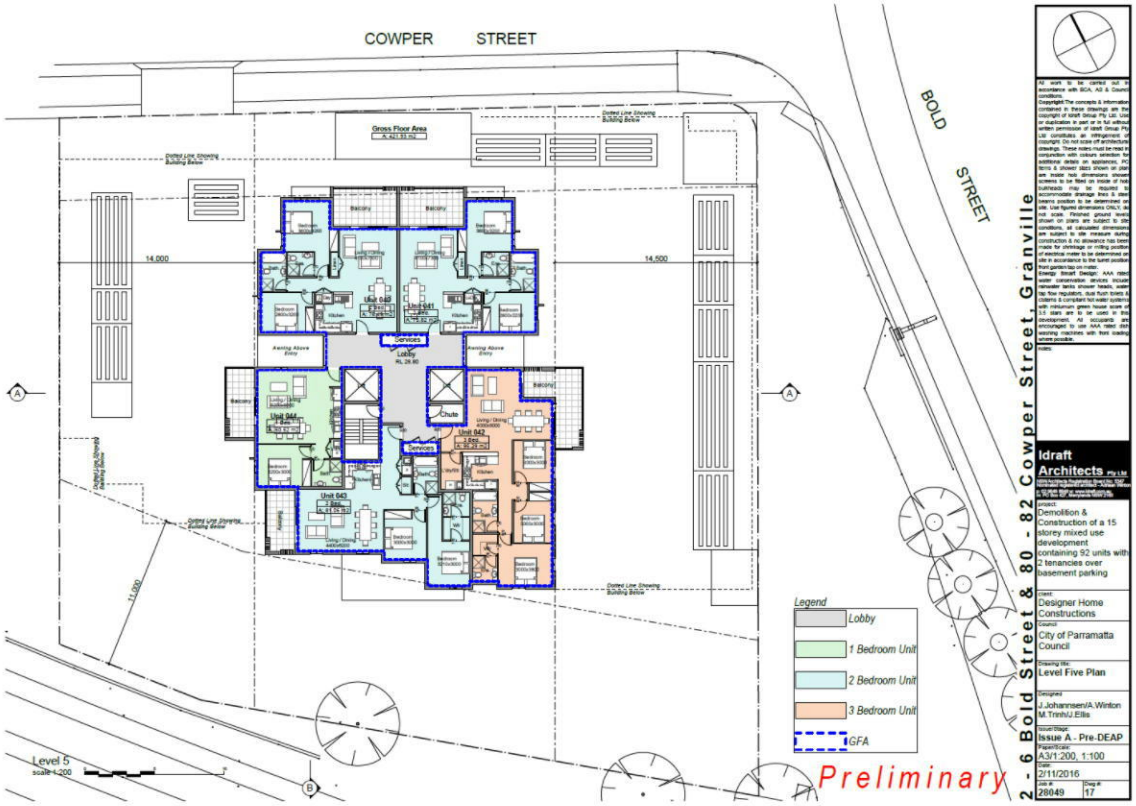


Figure 2-10 Sixteenth to Fourteen Level Floor Plan

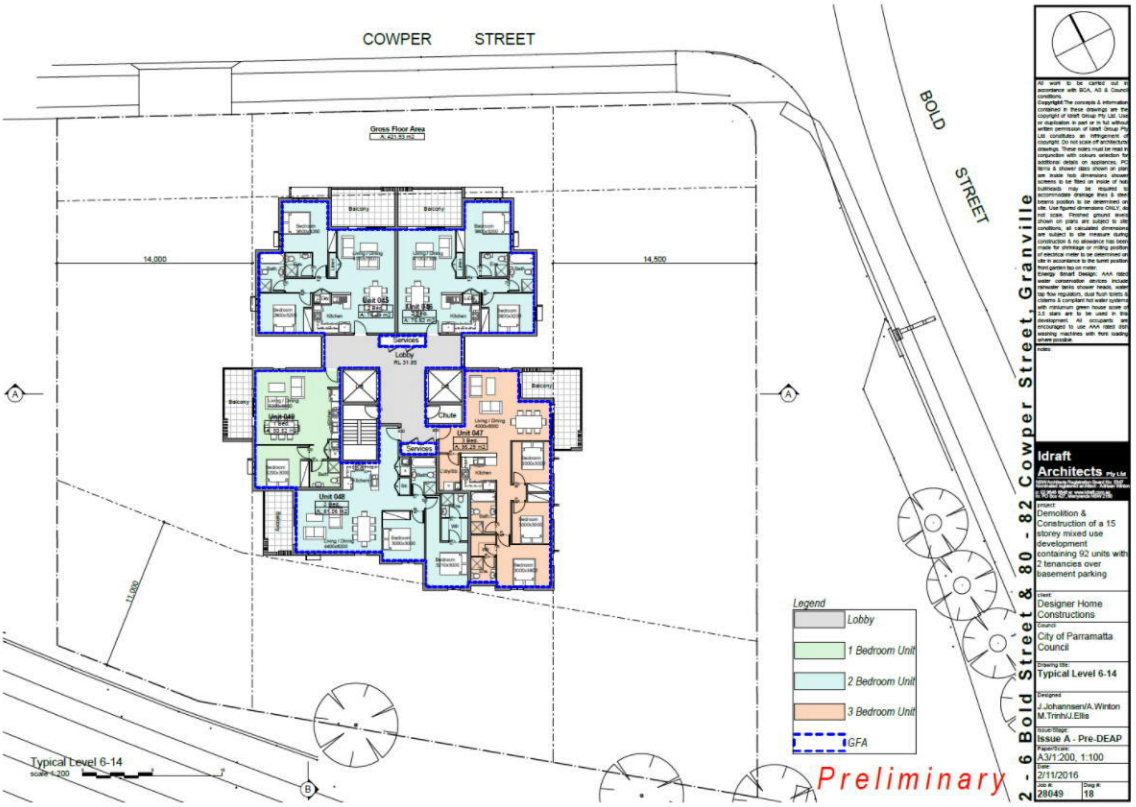


Figure 2-11 Penthouse Floor Plan

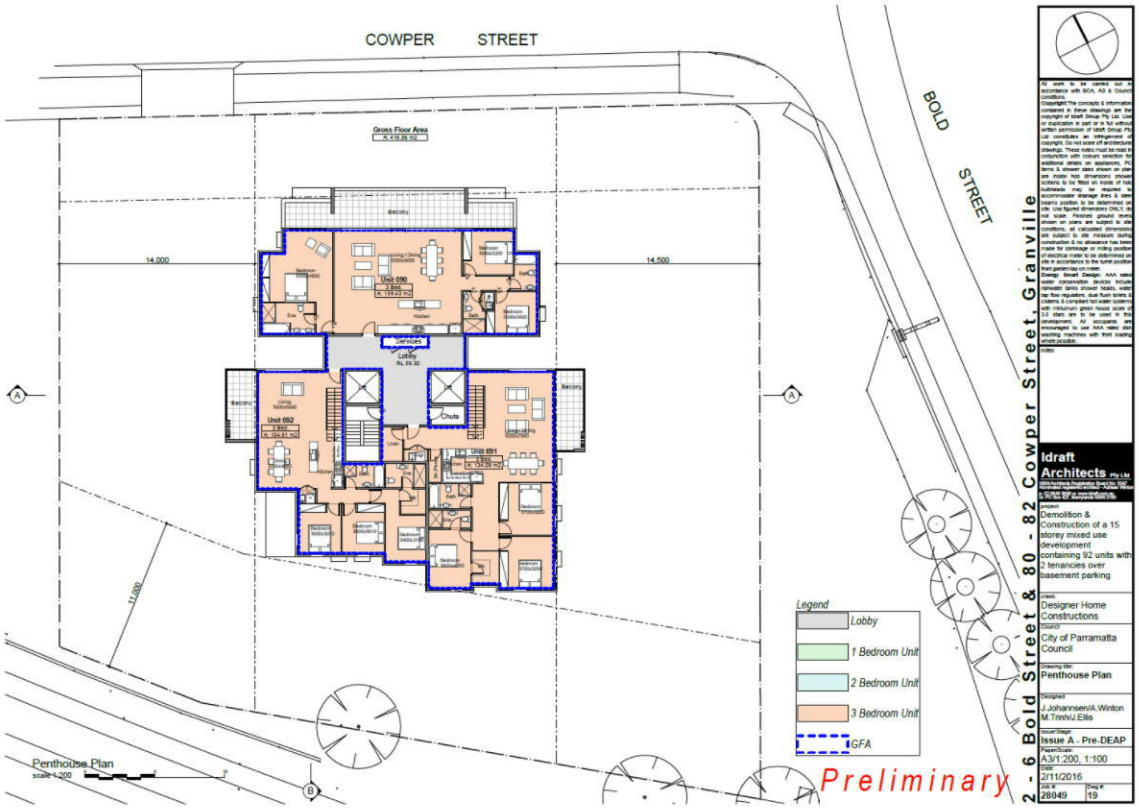
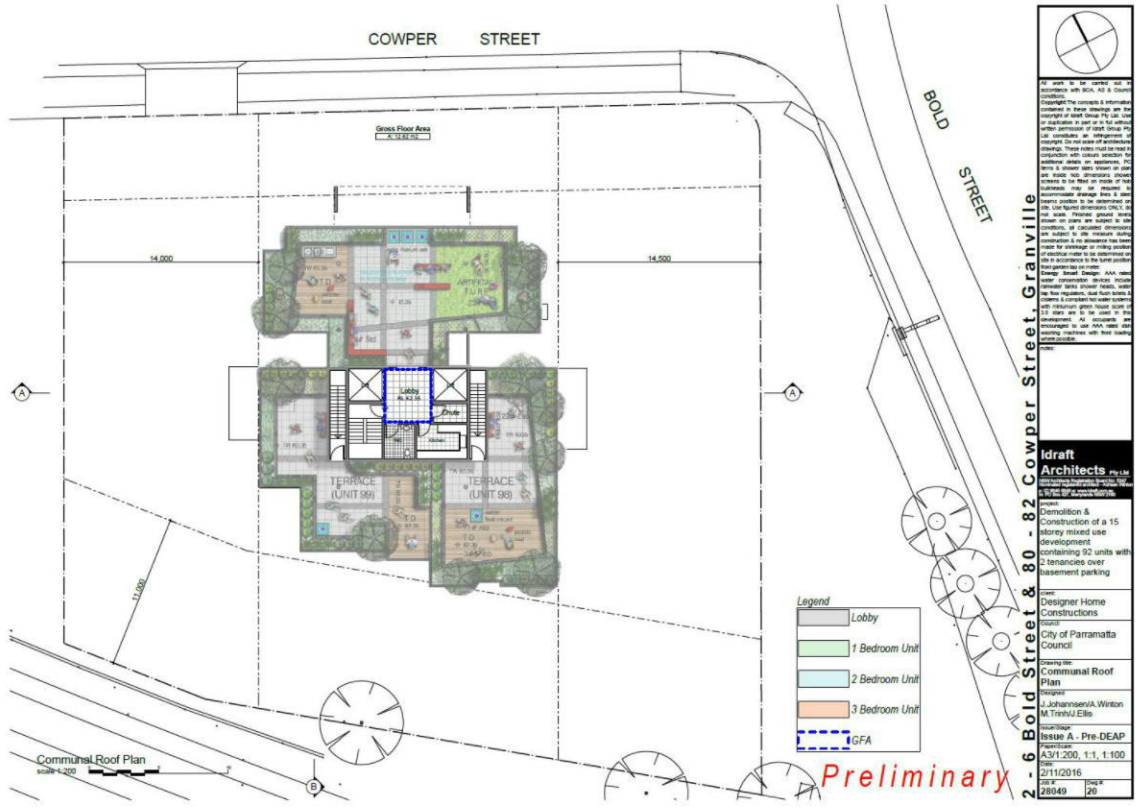


Figure 2-12 Communal Roof Plan



3 NOISE CRITERIA

3.1 Road Traffic and Rail: NSW SEPP (Infrastructure) 2007

SEPP (Infrastructure) 2007 was introduced to assist the delivery of necessary infrastructure by improving regulatory certainty and efficiency. The Infrastructure SEPP has specific planning provisions and development controls for various types of infrastructure and to developments adjacent to infrastructure.

Clause 102 includes provisions to ensure that any proposed noise sensitive development adjacent to road corridors which carry considerable traffic volumes are not adversely affected by road noise or vibration.

The clause applies to developments adjacent to roads with an annual average daily traffic volume (AADT) of more than 40,000 vehicles (based on the traffic volume data published on the Roads and Traffic Authority website), and that the consent authority considers likely to be adversely affected by road noise or vibration.

Where residential development is proposed, appropriate measures must be taken to ensure that the following internal noise levels are met:

- The L_{Aeq} noise level between the hours of 10.00 pm and 7.00 am shall not exceed 35 dBA within a bedroom, and
- The L_{Aeq} noise level within any other habitable room (excluding a garage, kitchen, bathroom or hallway) shall not exceed 40 dBA at any time.

The RTA counting station on Parramatta Road, Granville was reported to carry 55,736 vehicles according to the 2005 AADT volume count.

Clause 87 includes provisions to ensure that any development that is on land in or adjacent to a rail corridor are not adversely affected by rail noise and vibration. Where residential development is proposed, appropriate measures must be taken to ensure that the following internal noise levels are met:

- The L_{Aeq} noise level between the hours of 10.00 pm and 7.00 am shall not exceed 35 dBA within a bedroom, and
- The L_{Aeq} noise level within any other habitable room (excluding a garage, kitchen, bathroom or hallway) shall not exceed 40 dBA at any time.

3.2 Operational Noise Criteria

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the EPA.

The EPA oversees the Industrial Noise Policy (INP) January 2000 which provides a framework and process for deriving noise criteria. The INP criteria for industrial noise sources have two (2) components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level amenity for particular land uses for residents and sensitive receivers in other land uses.

Intrusiveness Criterion

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (LAeq) of the source should not be more than 5 dB(A) above the measured Rated Background Level (RBL), over any 15 minute period.

Amenity Criterion

The amenity criterion is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The criteria relate only to other industrial-type noise sources and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industrial-type noise sources, (including air-conditioning mechanical plant) need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the criterion.

Area Classification

The INP characterises the "Urban" noise environment as an area with an acoustical environment that:

- Is dominated by 'urban hum' or industrial source noise
- 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 term 'urban hum' means the aggregate sound of many unidentifiable, mostly traffic-related sound sources. The area surrounding the proposed development falls under the "Urban" area classification.

Project Specific Noise Levels

Having defined the area type, the processed results of the attended noise monitoring have been used to determine project specific noise criteria. The intrusive and amenity criteria for nearby residential premises are presented in

Table 3-1. These criteria are nominated for the purpose of assessing potential noise impacts from the proposed development.

In this case, the ambient noise environment is not controlled by industrial noise sources and therefore the amenity criteria become equal to the Recommended Amenity Criteria for Residences in an Urban Area (ie ANL or Acceptable Noise Level). For each assessment period, the lower (ie the more stringent) of the amenity or intrusive criteria are adopted.

These are shown in bold text in

Table 3-1.

Table 3-1 Operational Noise Criteria

Receiver	Time of Day	ANL [1] $L_{Aeq(15min)}$	Measured		Criteria for New Sources	
			RBL [2] $L_{A90(15min)}$	L_{Aeq} Noise Level)	Intrusive $L_{Aeq(15min)}$	Amenity [3] $L_{Aeq(15min)}$
Residential	Day	60	57	64	62	**54**
	Evening	50	55	63	60	**53**
	Night	45	51	61	56	**51**
Commercial	When in use	65	57	64	62	**59**

Note 1: ANL = "Acceptable Noise Level" for residences in Urban Areas.
Note 2: RBL = "Rating Background Level".
Note 3: Assuming existing noise levels are unlikely to decrease in the future
Note 4: Current measured RBL meets the ANL requirement

4 BASELINE NOISE SURVEY

4.1 Unattended Noise Monitoring

In order to characterise the existing acoustical environment of the area, unattended noise monitoring was conducted between the dates of 17th September and 24th September 2014. The logger location was representative of the façades of the proposed residential apartments to Parramatta Road and the nearby rail corridor. The logger location captures road traffic noise from Parramatta Road and surrounding local road, as well as rail noise from the nearby rail corridor to the south of the development site.

Data affected by adverse weather conditions have been removed from the calculations. The logger location was selected with consideration to other noise sources which may influence readings, security issues for noise monitoring equipment and gaining permission for access from residents and landowners.

Instrumentation for the survey comprised of a Svantek 959 environmental noise logger (serial number 11248) fitted with microphone windshields. Calibration of the logger was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB(A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Measured data has been filtered to remove data measured during adverse weather conditions upon consultation with historical weather reports provided by the Bureau of Meteorology (BOM).

To assess noise intrusion into the proposed residential apartments, the data obtained from the Logger Location has been processed to establish representative ambient noise levels at the proposed mixed development site. The time periods used for this assessment are as defined in the NSW Environmental Protection Authority's (EPA) Road Noise Policy (RNP, 2011). Results are presented below in. The results of the ambient noise monitoring are shown in Table 4-1.

Table 4-1 Summarised Noise Exposure Levels

Location	Period	External Noise Levels dB(A)
Logger Location	Day Time 7:00 am - 10:00 pm	65 $L_{Aeq(15hour)}$
	Night Time 10:00 pm - 7:00 am	59 $L_{Aeq(9hour)}$

5 NOISE ASSESSMENT

5.1 Road Traffic and Rail Noise Impact Assessment

This assessment predicts road traffic noise intrusion from Parramatta Road and rail noise from the nearby rail corridor to the proposed development.

Standard window glazing of a building will typically attenuate these noise levels by 20 dB(A) with windows closed and 10 dB(A) with windows open (allowing for natural ventilation). The predicted internal noise levels of the proposed residential units are presented in Table 5-1 for the windows open and windows closed scenarios. Standard window system (4 mm thick glass with aluminium frame) has been assumed for this prediction.

Table 5-1 Predicted Internal Road Traffic and Rail Noise Levels - Standard Glazing

Type of Occupancy	Descriptor	Internal Noise Level		Noise Criteria
		Windows Open	Windows Closed	
Northern Façade (Parramatta Road)				
Living Areas (Daytime)	$L_{Aeq,15hour}$	55 dB(A)	45 dB(A)	40 dB(A)
Living Areas (Night time)	$L_{Aeq,9hour}$	50 dB(A)	40 dB(A)	40 dB(A)
Sleeping Areas (Night time)	$L_{Aeq,9hour}$	50 dB(A)	40 dB(A)	35 dB(A)
Southern Façade (Rail Corridor)				
Living Areas (Daytime)	$L_{Aeq,15hour}$	65 dB(A)	55 dB(A)	40 dB(A)
Living Areas (Night time)	$L_{Aeq,9hour}$	60 dB(A)	50 dB(A)	40 dB(A)
Sleeping Areas (Night time)	$L_{Aeq,9hour}$	60 dB(A)	50 dB(A)	35 dB(A)
Eastern Façade (Bold Street)				

Type of Occupancy	Descriptor	Internal Noise Level		Noise Criteria
		Windows Open	Windows Closed	
Living Areas (Daytime)	$L_{Aeq,15hour}$	55 dB(A)	45 dB(A)	40 dB(A)
Living Areas (Night time)	$L_{Aeq,9hour}$	50 dB(A)	40 dB(A)	40 dB(A)
Sleeping Areas (Night time)	$L_{Aeq,9hour}$	50 dB(A)	40 dB(A)	35 dB(A)
		Western Façade		
Living Areas (Daytime)	$L_{Aeq,15hour}$	55 dB(A)	45 dB(A)	40 dB(A)
Living Areas (Night time)	$L_{Aeq,9hour}$	50 dB(A)	40 dB(A)	40 dB(A)
Sleeping Areas (Night time)	$L_{Aeq,9hour}$	50 dB(A)	40 dB(A)	35 dB(A)

The predicted internal noise levels indicate that road traffic noise and rail noise impact on the proposed residential units will potentially exceed the noise criteria with windows opened and closed. When windows are opened, road traffic and rail noise in the Living Areas and Sleep Areas will exceed the criteria by up to 25 dB(A) and 15 dB(A) respectively.

When windows are closed, road traffic noise in the Living Areas and Sleep Areas will exceed the criteria by up to 10 dB(A) and 15 dB(A) respectively. Measured L_{max} noise levels were used to predicted noise levels on the southern façade as this best represents rail noise emissions from the nearby rail corridor. Measured L_{max}, L_{Aeq} and L_{90} are presented in Appendix A.

5.2 Mechanical Plant Noise Impact Assessment

It is understood that the external mechanical plant selected for the proposed residential development are the car park exhaust & supply fans, outside air supply fans, garbage chute exhaust fans and garbage room fans.

There are no other significant noise emitting from the mechanical services proposed for this development. Mechanical plant specification has not been finalised for this development.

The recommended fan models and manufacturer's Sound Power Level (SWL) have been has been used by Rodney Stevens Acoustics in similar developments and are presented in Table 5-2 below.

Table 5-2 Sound Power Level of Proposed Mechanical Plant

Name	No. Off	l/s	Sound Power SWL, dB at Octave Band Centre Frequency (Hz) (Each Item)							
			63	125	250	500	1k	2k	4k	8k
Car Park Exhaust Fan (Ground Floor)	1	17,640	83	87	86	85	82	74	69	67
Car Park Exhaust Fan (Lower Basement)	1	60	-	48	56	57	54	53	45	38
Car Park Supply Fan (Ground Floor)	1	13,160	74	80	79	77	74	68	63	68
Garbage Room Exhaust Fan (Ground Floor)	1	150	-	52	56	65	58	59	54	47
Outside Air Supply Fan (Roof)	1	440	-	62	69	73	75	74	68	59
Outside Air Supply Fan (Roof)	1	600	-	62	69	73	75	74	68	59
Garbage Chute Exhaust Fan (Roof)	1	400	78	77	68	65	60	58	56	52
Garbage Chute Exhaust Fan (Roof)	1	400	78	77	68	65	60	58	56	52
Garbage Room Exhaust Fan (Roof)	1	300	-	62	69	73	75	74	68	59
Garbage Room Exhaust Fan (Roof)	1	280	83	77	69	66	58	58	56	50

The assessment of potential noise impact from the operation of the proposed mechanical plant has been based on the prediction of noise propagation over increasing separation distance from the each plant location. Equation 5-1 has been applied with the SWLs to predict noise impacts at nearest receivers. The equation does not account for noise attenuation from and the local terrain.

Equation 5-1 Calculation for the prediction of operational noise

$$SPL_{received} = SWL_{source} - 20\log(r) - 8$$

The equation includes a - 8 dB(A) correction to account for the loss of acoustic energy from hemi-spherical radiation.

The predicted noise impact of the proposed mechanical plant at nearest surrounding residential boundaries has been calculated and is presented in Table 5-3 below. To account for a worst case scenario, the predicted noise impact is of all plant operating simultaneously.

The noise impact of the proposed mechanical plant has also been predicted to the nearest windows of future residences within the development.

Table 5-3 Predicted New Roof Mechanical Plant Noise at Neighbouring Residences

Receiver Location	Predicted Worst Case Mechanical Plant Operational L_{Aeq} Noise Level – dB(A)	Noise Criterion at Receiver Location – dB(A)	Compliance (Yes/No)
84 Cowper Street	50	59	Yes
154-160 Bold Street	43	59	Yes
68 Cowper Street	43	59	Yes

Based on the predicted noise levels in Table 5-3, the operation of the mechanical plant has been assessed to comply with the noise criteria at the nearby residential receivers. The noise prediction also takes into account the operation of the basement roller door and its impact to nearby residential dwellings.

However, the once the mechanical plant and equipment have been finalised, it is recommended to review the final mechanical plants and equipment by a qualified acoustic consultant.

6 CONSTRUCTION NOISE MANAGEMENT

6.1 Proposed Construction Works

All construction works required to complete the proposed development will be undertaken during standard daytime construction hours of 7:00 am – 5:00 pm Monday to Friday and 8:00 am – 5:00 pm Saturday only. Works outside of the standard daytime construction hours will only be undertaken with prior assessment and required approvals.

The construction program is to include the following key work stages and potential noise and ground vibration generating activity:

- Demolition of the parts of the existing building located at the project site;
- Excavation of some of the bedrock adjacent to the residence;
- Construction of the new parts of the residential building including foundation works, concreting and infrastructure installation of framework, walls, roof and electrical fit out;

The construction phases will include some limited site clearance, foundation preparation and infrastructure installation. It is our understanding that the construction programme is proposed to be more than 3 weeks in duration.

6.2 Construction Noise and Vibration Criteria

6.2.1 Construction Noise

Noise criteria for construction works are established in accordance with the EPA *Interim Construction Noise Guidelines* (ICNG).

All construction works are to be undertaken during daytime core hours of 7:00 am – 5:00 pm Monday to Friday and 8:00 am – 5:00 pm Saturday. No construction works are anticipated to be required outside of the standard daytime standard construction hours unless otherwise approved.

The ICNG provides recommended construction (airborne) noise management levels for residential receivers as detailed in Table 6-1.

Site specific noise management levels (NML) have been established adopting the background noise levels (L_{A90}) measured within the project site.

The noise management levels are design as a trigger for the project to investigate feasible and reasonable noise management and mitigation measures to reduce noise impacts at nearest noise affected receivers.

Table 6-1 Recommended Residential Construction Noise Criteria

Time of construction	Noise Management level $L_{Aeq,\ 15min}$	Adopted noise NML $L_{Aeq,\ 15min}$ at neighbouring residences
Standard construction hours Monday to Friday 7 am – 5 pm Saturday 8 am - 5 pm No work on Sundays or public holidays	Noise affected receivers RBL + 10 dB(A)	67 dB(A)

Note: RBL rating background level, the measured L_{A90} noise level.

As construction works for the proposed development will only be carried out during the daytime period a standard daytime construction noise management level for the neighbouring residential receivers of 65 dB(A) $L_{Aeq,\ 15min}$ has been adopted in accordance with the ICNG. NMLs for the evening and night periods are not applicable to this assessment.

There are no noise sensitive receivers such as schools, hospitals or places of worship that have been identified within the study area.

A 75 dB(A) $L_{Aeq,15min}$ highly noise affected construction noise management level will be applied as a trigger for the application of additional construction noise controls such as respite periods or restriction of construction hours of operation. This trigger would apply to noise impacts on residential receivers only.

The recommended noise management levels are planning goals only. Factors such as the social benefits of the activity, economic constraints, and the nature and duration of the proposed construction program need to be considered when assessing potential noise impacts from construction works.

6.2.2 Construction Vibration

Vibration during construction works is considered an intermittent source associated with two main types of impact; disturbance at receivers and potential architectural/structural damage to buildings.

Generally, if disturbance issues are controlled, there is limited potential for structural damage to buildings.

Holroyd City Council currently does not have specific criteria concerning vibration emanating from construction. It is recommended the criteria outlined in EPA *Interim Construction Noise Guidelines* be adopted for the construction of the proposed development.

Detailed in Table 6-2, the ICNG guidance adopts the *Environmental Noise Management Assessing Vibration: a technical guideline* (2006) for the assessment of human annoyance due to construction vibration. German Standard DIN 4150: Part 3-1999, provides guidelines for evaluating the effects of vibration on structures.

Dependent upon the dominant frequency of vibration, assessed in Hertz (Hz), structural vibration limits are established at the foundation of nearest buildings.

Table 6-2 Adopted Vibration Constriction Criteria

Receiver	Annoyance VDV criteria, $m/s^{1.75}$		Structural PPV criteria, mm/s
	Preferred	Maximum	
Residential	0.2	0.4	5 - 20

Notes: structural vibration goals established for < 10 – 100 Hz dominant frequency of vibration. VDV = vibration dose value; PPV = peak particle velocity

6.3 Construction Noise & Vibration Management Plan

6.3.1 Construction Noise

The basis for the project-specific construction airborne noise goals for approved daytime hours is shown in Table 6-1.

Where the noise goals shown in Table 6-1 cannot be achieved, the construction contractor will use all reasonable and feasible noise mitigation and management measures to reduce noise generation and impacts.

6.3.2 Construction Vibration

The construction contractor will, if required, ensure compliance with the criteria of Table 6-2. It is anticipated that there will be minimal Construction Vibration within this development.

6.3.3 Typical Plant & Equipment Sound Pressure Levels

Sound pressure levels for typical items of plant are listed in Table 6-3. These noise levels are representative of modern plant operating with noise control measures in good condition.

Table 6-3 Noise Levels of Typical Construction Plant & Equipment

Item	Typical Plant Type	Typical L_{Aeq} Noise Level at 15 metres – dB(A)
Excavator	5 to 8 tonne	75
Bob Cat		71
Tip trucker		72
Hand Tools:- saws, nail gun, drills, hammers,		70
Concrete pump		75
Cement mixer		75
Crane		70
Kango		75

6.4 Noise & Vibration Mitigation Measures

6.4.1 Noise Control

The following noise mitigation measures will, if required, be implemented. The construction contractor will, where reasonable and feasible, apply best practice noise mitigation measures including:

- Maximising the offset distance between noisy plant items and nearby noise sensitive receivers.
- Avoiding the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers.
- Minimising consecutive works in the same locality.
- Orienting equipment away from noise sensitive areas.
- Carrying out loading and unloading away from noise sensitive areas.

In order to minimise noise impacts during the works, the construction contractor will take all reasonable and feasible measures to mitigate noise effects.

The contractor will also take reasonable steps to control noise from all plant and equipment. Examples of appropriate noise control include efficient silencers and low noise mufflers.

Silenced air compressors, fitted with noise labels indicating a maximum (L_{Amax}) sound pressure level of not more than 75 dB(A) at 7 m will be used on site. The sound pressure level of noise emitted from a compressor used will comply with noise label requirements.

6.4.2 Vibration Control

The following vibration mitigation measures will be implemented by the construction contractor:

- Relocate any vibration generating plant and equipment to areas within the site in order to lower the vibration impacts.
- Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment.
- Use lower vibration generating items of excavation plant and equipment e.g. smaller capacity rockbreaker hammers.
- Minimise consecutive works in the same locality (if applicable).
- Schedule a minimum respite period of at least 1 hour before activities commence which are to be undertaken for a continuous four hour period. The respite period is to be between 12:00 pm to 1:00 pm prior to the 1:00 pm to 5:00 pm continuous four hour activity.

6.4.3 Summary of Mitigation Measures

The noise and vibration mitigation measures to be implemented by the construction contractor are listed in Table 6-4.

Table 6-4 Summary of Noise & Vibration Mitigation Measures

Item	Description
Construction Hours	Works will be carried out within the standard construction hours.
Deliveries	Deliveries will be carried out within the standard construction hours.
Site Layout	Where possible, plant and equipment will be located and orientated to direct noise away from sensitive receivers.
Quietest Suitable Equipment	Plant and equipment will be selected to minimise noise emission, where possible, whilst maintaining efficiency of function. Residential grade silencers will be fitted and all noise control equipment will be maintained in good order.
Hammer Equipment	Maximise hammer penetration (and reduce blows) by using sharp hammer tips. Keep stocks of sharp profiles at site, and monitor the profiles in use.
Reversing Alarms	Mobile plant and trucks operating on site for a significant portion of the project will have reversing alarm noise emissions minimised, where possible, recognising the need to maintain occupational safety standards.
PA System	No public address system will be used at this site.
Truck Noise (off site)	All trucks regularly used for the project are to have mufflers, and any other noise control equipment, maintained in good working order. Trucking routes will use main roads, where feasible.
Construction Hours	Works will be carried out within the standard construction hours.

6.5 Identifying and Managing Future Noise & Vibration Issues

If additional activities or plant are found to be necessary that will emit noise and/or vibration emissions significantly exceeding those assumed for this assessment, these will, if required, be assessed by the Acoustical Consultant on a case-by-case basis and appropriate mitigation measures will be implemented.

6.6 Complaint Handling

The construction contractor will adopt the following protocol for handling complaints. This protocol is intended to ensure that the issues are addressed and that appropriate corrective action is identified and implemented as necessary:

- The project manager will record all verbal and telephone complaints in writing and will forward all complaints to the contractor, together with details of the circumstance leading to the complaint and all subsequent actions.
- Complaints received by the contractor will, as an initial step, be referred to the project manager who will respond as described above.
- The contractor will investigate the complaint in order to determine whether a criterion exceedance has occurred or whether noise and/or vibration have occurred unnecessarily.
- If excessive or unnecessary noise and/or vibration have been caused, corrective action will be planned and implemented by the project manager.
- Complainants will be informed by contractor that their complaints are being addressed, and (if appropriate) that corrective action is being taken.

Complainants will be informed of the implementation of the corrective action that has been taken to mitigate the adverse effects

7 RECOMMENDATIONS

Based on the above predicted road traffic noise impacts (refer Table 5-1) the following noise control measures are recommended for the residential units on all façades.

- Windows and doors in the facade of residential units facing or with line of sight of Parramatta Road and the rail corridor, and facing east and west will need to be closed to meet internal noise levels. Operable window design can be incorporated however the required acoustic rating for the window is required to be followed. Alternative ventilation methods might be required to meet the ventilation requirements of the BCA and Australian Standard AS 1668.2:2002 for the purposes of comfort to the residences.

Based on the predicted internal noise levels, residential units on all façades should have the following minimum Rw rating as indicated in Table 7-1.

Table 7-1 In-principle Glazing Recommendations

Location	Minimum Glazing Rw Rating
Northern Façade (Parramatta Road)	
Living Rooms	Rw 35
Bedrooms	Rw 41
Southern Façade (Rail Corridor)	
Living Rooms	Rw 40
Bedrooms	Rw 43
Eastern Façade (BoldStreet)	
Living Rooms	Rw 32
Bedrooms	Rw 36
Western Façade	
Living Rooms	Rw 34
Bedrooms	Rw 38

Note *: glazing system are for reference only. Any glazing system to be installed for the development is to achieve the minimum Rw rating indicated above

Note Rw ratings provided rely on the acoustic performance of the window glazing and frame. Rw ratings should be checked with glazing manufacturers and frames should be selected and installed to preclude degrading the performance of the glazing. It is also recommended that glazing specifications are reviewed at the detailed design stage, most notably if changes to the glazing area are made throughout the design.

8 CONCLUSION

Rodney Stevens Acoustics has been engaged by iDraft Pty Ltd to perform a road traffic, rail and mechanical noise assessment and construction noise management of the proposed mixed development at 2-6 Bold Street & 80-82 Cowper Street Granville as part of the DA submission.

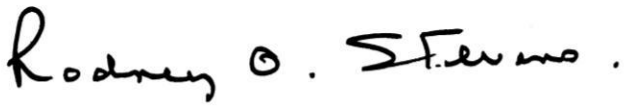
This assessment references:

- NSW DoP's State Environmental Planning Policy (Infrastructure)

A noise assessment comprising road traffic and rail noise calculations has been conducted. External and internal noise levels have been considered and assessed against the relevant acoustic criteria. In-principal recommendations of improved glazing and mechanical ventilation of habitable rooms have been made in Section 7

This assessment only considers road traffic and rail noise ingress for the purposes of DA lodgement and does not identify or assess noise impact from other noise sources which may be present in the vicinity of the proposed development.

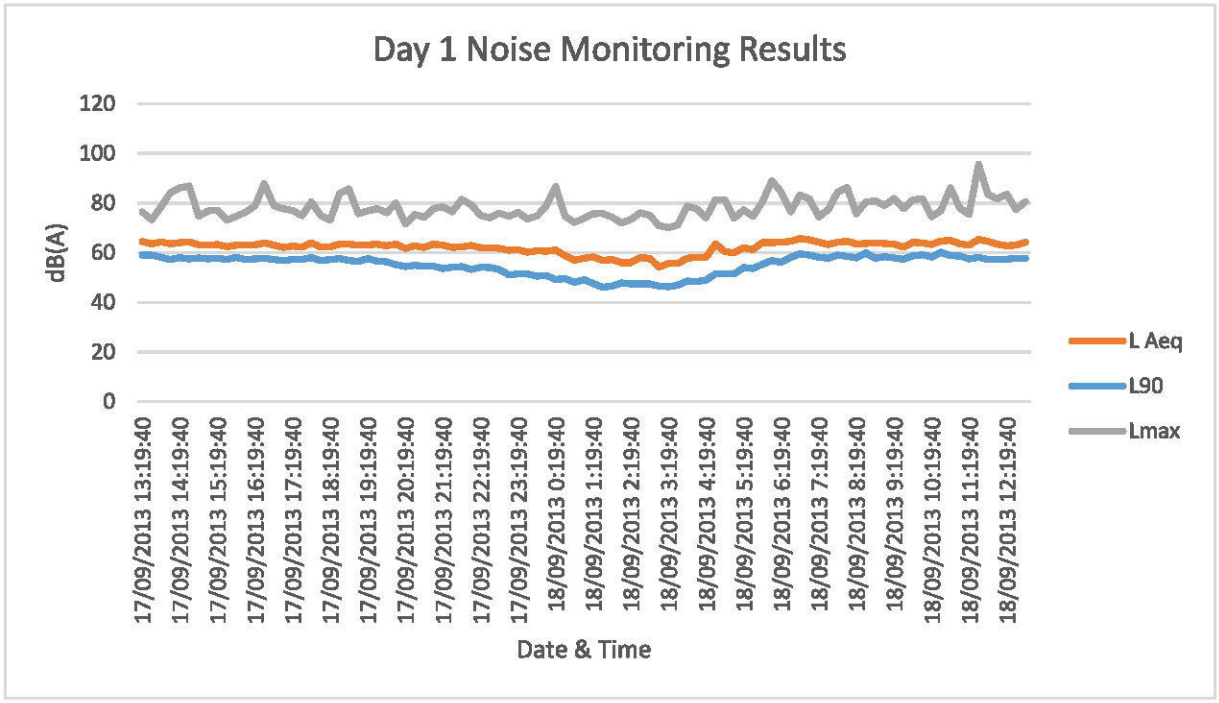
Approved:-



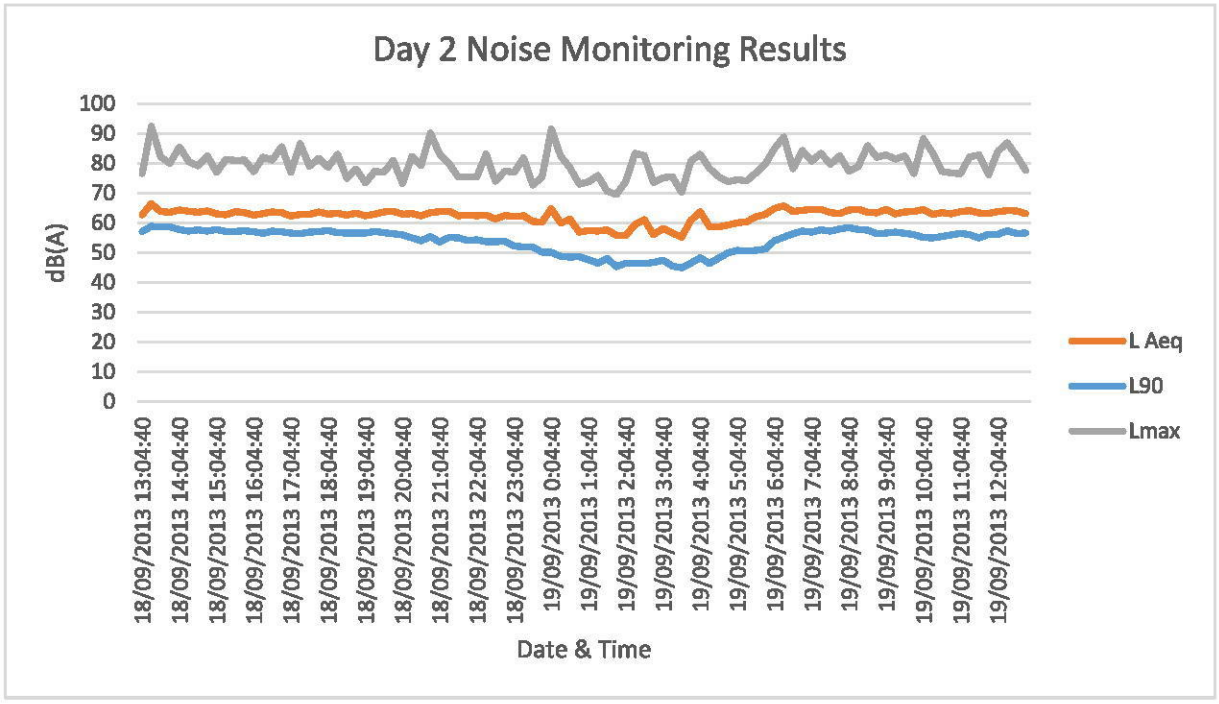
Rodney Stevens – MAAS
Principal/Manager

Appendix A – Noise Monitoring Results

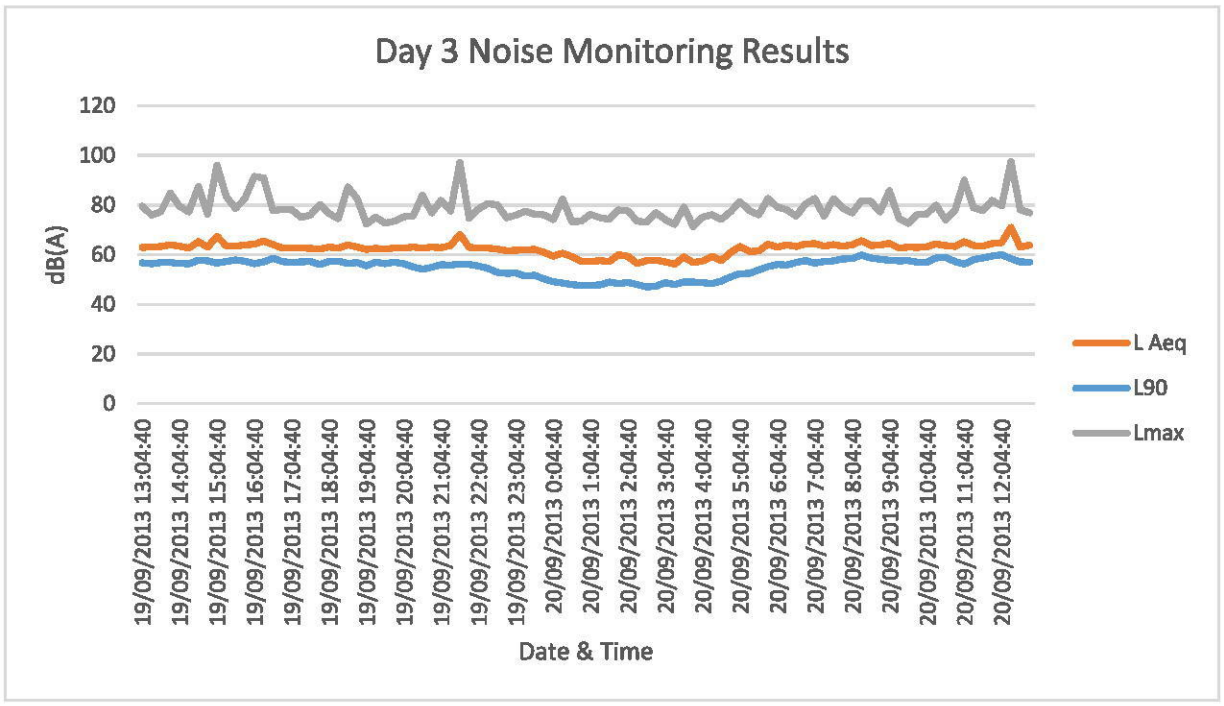
Day 1: Tuesday Noise Results



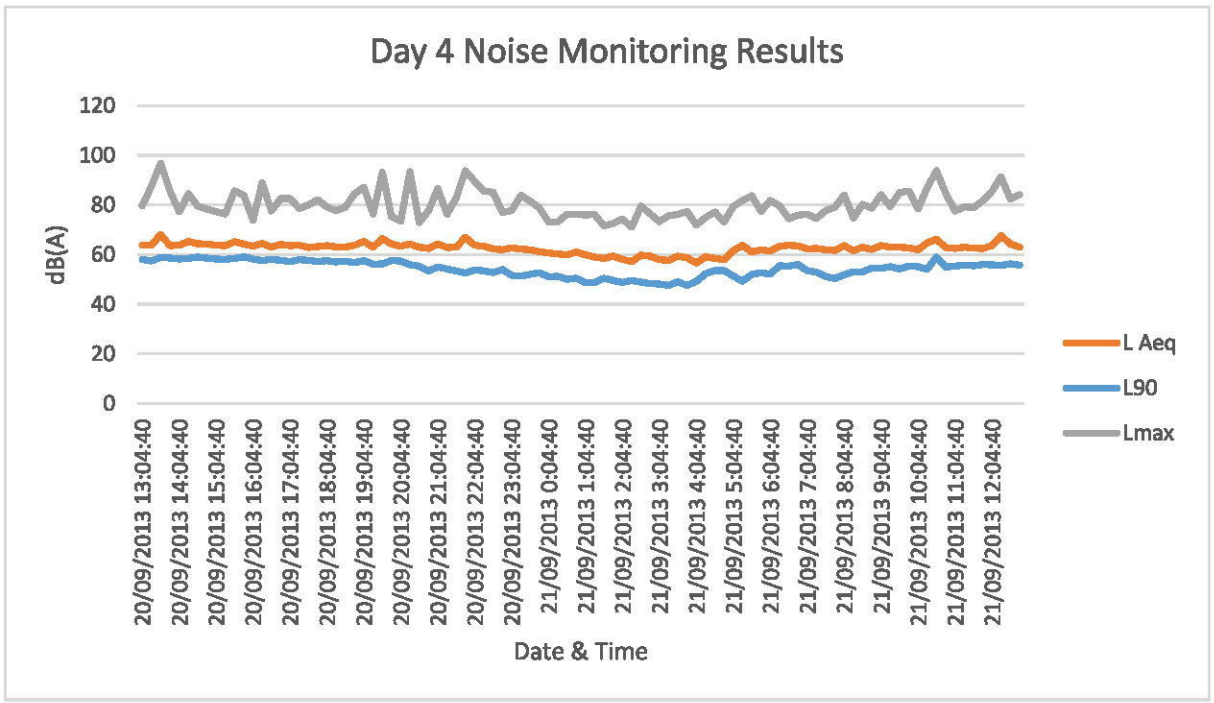
Day 2: Wednesday Noise Results



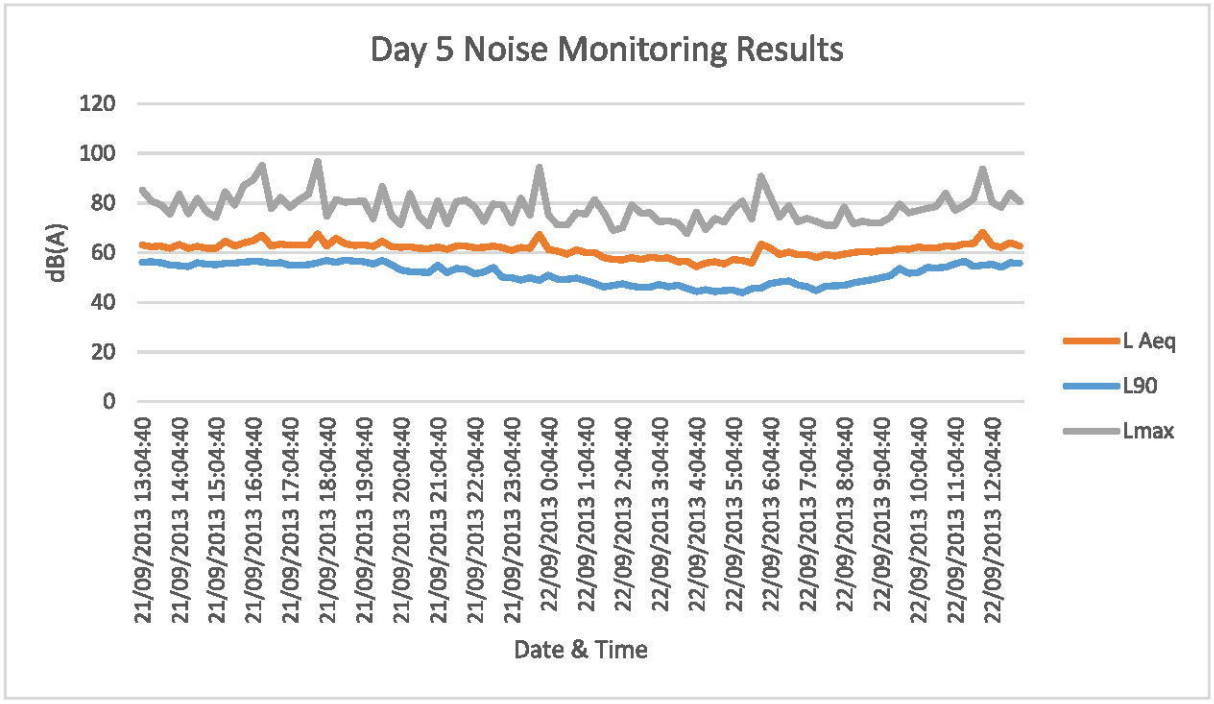
Day 3: Thursday Noise Results



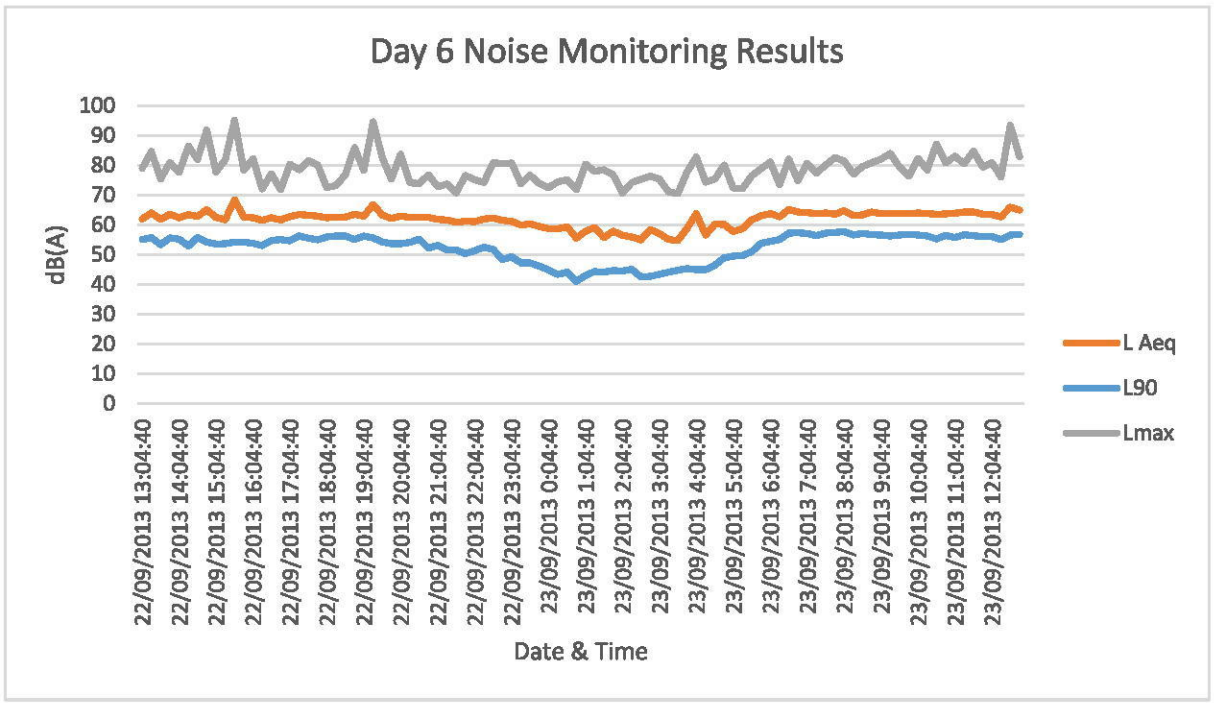
Day 4: Friday Noise Results



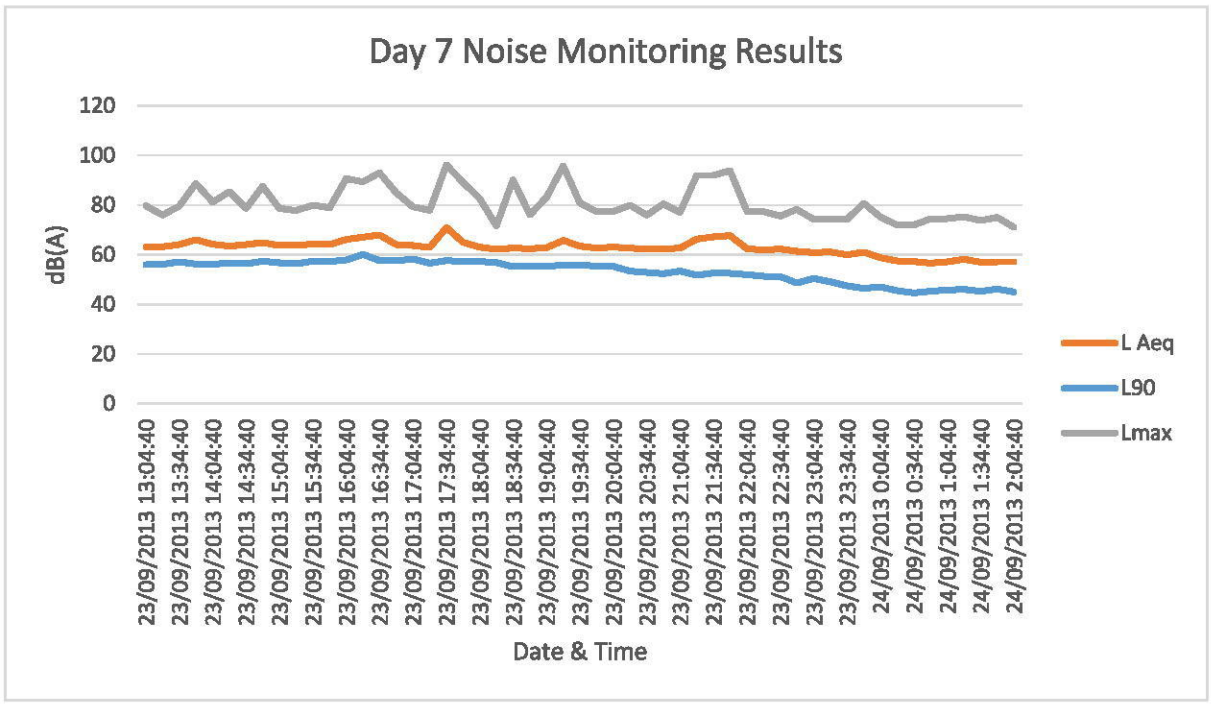
Day 5: Saturday Noise Results



Day 6: Sunday Noise Results

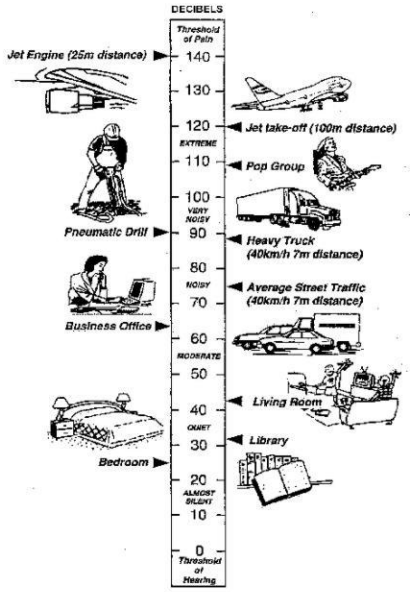


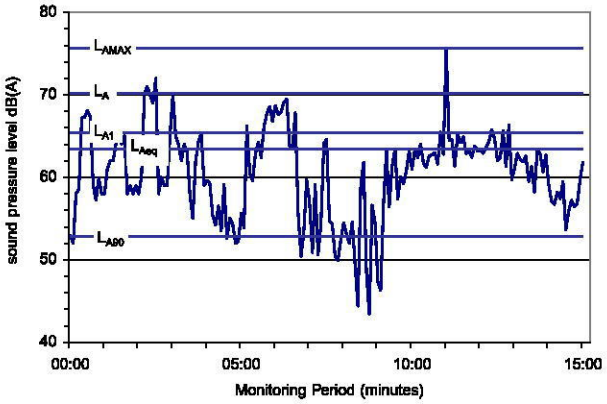
Day 7: Monday Noise Results



Appendix B – Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The **total** noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	**Includes** noise annoyance due to: ▪ character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) ▪ character of the environment (e.g. very quiet suburban, suburban, urban, near industry) ▪ miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) ▪ human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: ▪ Noise mitigation benefits (amount of noise reduction provided, number of people protected). ▪ Cost of mitigation (cost of mitigation versus benefit provided). ▪ Community views (aesthetic impacts and community wishes). ▪ Noise levels for affected land uses (existing and future levels, and changes in noise levels).
Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.
Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive **noise** (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).

Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10th percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	**Sound** (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.  dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.
Sound power Level (SWL)	The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.

Sound Pressure Level (SPL)	The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.
Statistic noise levels	**Noise** levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level. A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:  Key descriptors: L_{Amax} Maximum recorded noise level. L_{A1} The noise level exceeded for 1% of the 15 minute interval. L_{A10} Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level. L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound. L_{A90} Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).
Threshold	The lowest sound pressure level that produces a detectable response (in an instrument/person).
Tonality	Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics