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Prepared for: MERITON CONSTRUCTIONS

PROPOSED RESIDENTIAL DEVELOPMENT

LOTS 101 AND 102, 42 WALKER STREET, RHODES

TRAIN NOISE AND VIBRATION ASSESSMENT

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1. INTRODUCTION

An assessment has been undertaken of the impact of train noise and vibration on the acoustic amenity of the proposed development. The following noise sources have been assessed:

- Northern Line rail corridor.

Rail traffic noise and vibration levels at the site have been measured and assessed in accordance with the requirements of the local council.

The assessment is based on drawings provided by Meriton Apartments dated 19/2/10.

The buildings are typically of concrete construction. All habitable rooms were assumed to have carpeted floors.

2. SITE DESCRIPTION

The proposed site is located on 42 Walker Street, Rhodes Lots 101 and 102 facing Walker Street. The subject site is potentially affected by rail traffic noise generated by the Northern Line rail corridor, approximately 20m east of the site.

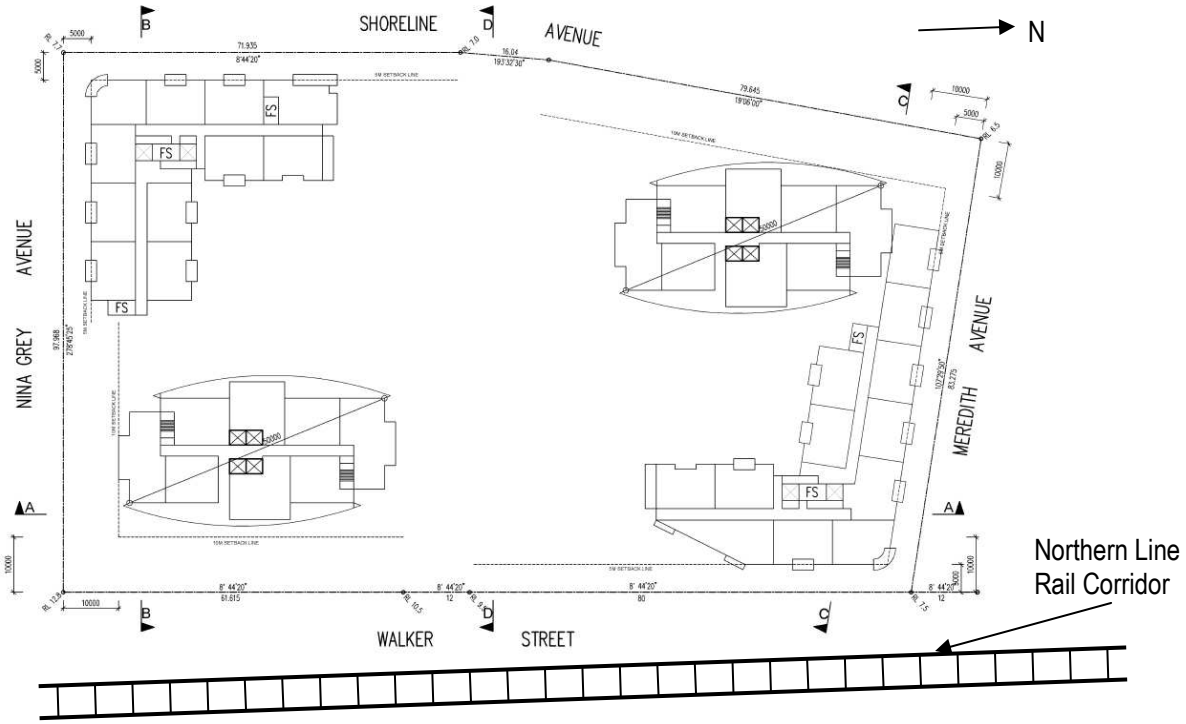

Figure 1 – Site Plan Showing Northern Line Rail Corridor

Figure 2 – Aerial Picture Showing Project Site and Railway Corridor

3. PROJECT NOISE OBJECTIVES

3.1 RAIL NOISE

Council requires that rail noise located adjacent to train lines must be assessed in accordance with AS3671 and AS2107. It is noted that the requirements of these standards are achieved when assessed in accordance with the Department of Planning in their publication 'Development near Rail Corridors and Busy Roads' dated 2008 nominate criteria for residential units which are assessed internally with windows closed. These are detailed in Table 1 below.

Table 1 – Internal Railway Noise Level Criteria

LOCATION	TIME OF DAY	$L_{Aeq,(Period)}$ dB(A)
Living and sleeping areas	Day (7am-10pm)	40
Sleeping areas	Night (10pm-7am)	35

4. MEASUREMENTS

Measurements were performed generally in accordance with the Australian Standard AS 1055 - "Description and measurement of environmental noise - General Procedures".

4.1 RAIL TRAFFIC NOISE MEASUREMENTS

This section details the attended rail traffic noise measurements which formed the base for this assessment.

4.1.1 Measurement Locations

Rail noise measurements were conducted in line with the proposed Walker Street facades for Lot 100 which is nearest to the railway lines and representative of the noise levels incident on Lots 101 and 102

4.1.2 Time of Measurements

Manned measurements were conducted on 1 December 2005. As movements on the rail line have not changed, these measurements remain representative of the current site noise exposure.

4.1.3 Measurement Equipment

A Norsonic type SA118 Sound Analyser was used for the noise measurements. The analyser was set to fast response and calibrated before and after the measurements using a Norsonics Sound Calibrator type 1251. No significant drift was noted.

4.1.4 Measured Noise Levels

The external noise levels from measurements conducted on site are detailed in Table 2 below.

Table 2 –External Noise Levels

Location	Day L_{eq} (1hr) Noise Level dB(A)	Night L_{eq} (1hr) Noise Level dB(A)
Proposed Walker Street façade for Lots 101-102	61	61

5. EVALUATION OF NOISE INTRUSION

Noise intrusion into the apartments was assessed using the measured levels in Section 4.

Calculations were performed taking into account the orientation of windows, barrier effects (where applicable), roof, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted.

In all cases, the selected glazing type (refer below) reduces internal noise levels to within the nominated criteria for the various space types. The external noise levels used in the calculations are those that would occur when the buildings are constructed on the site.

The floor finishes for the living and bedroom spaces have been assessed as having carpet finishes.

5.1 RECOMMENDED GLAZING

Table 3 lists the recommended glazing assemblies for this project. Glazing to all rooms not listed may be standard glazing without acoustic seals for windows and doors.

The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement. It is noted that no skylights are nominated on the drawings. Where windows are not nominated they shall be standard glazing without acoustic seals.

Table 3 - Recommended Glazing

Lot	Facade	Room	Glazing	Seals
101-102	Walker Street	Living Areas	4mm float	Yes
		Bedrooms	6.38mm laminated	Yes
	Northern and Southern	All	4mm float	Yes
	Western	All	4mm float	Yes

In addition to meeting the minimum glazing thickness requirements given, the design of the window mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the STC rating of the glazing assembly below the values nominated in Table 4. Note that mohair type seals will not be acceptable for the windows requiring acoustic seals.

Table 4 - Minimum STC of Glazing

Glazing Assembly	Acoustic Seals	Minimum STC of Installed Window
4mm float	Yes	27
6.38mm laminated	Yes	31

The window/door suppliers should provide evidence that the systems proposed have been tested in a registered laboratory with the recommended glass thicknesses and comply with the minimum STC requirements listed in Table 4. Also, the glazing installer should certify that the window/doors have been constructed and installed in a manner equivalent to the tested samples.

5.2 ENTRY DOORS

Apartment entry doors will require no additional acoustic treatment.

5.3 ROOF/ CEILING CONSTRUCTIONS

Proposed external roof / ceilings constructed from concrete will be acoustically satisfactory for rail traffic noise intrusion.

5.4 EXTERNAL WALLS

Proposed external concrete wall elements will be acoustically satisfactory for rail traffic noise intrusion.

6. VENTILATION

The predicted internal noise level within living areas with windows open for natural ventilation is in compliance with the recommendations of 'Development near Rail Corridors and Busy Roads'.

The recommended internal noise levels within bedrooms cannot be achieved with windows open. It is proposed that the outside air source can be provided via the opening of living room windows to provide the required open area (ie 5% of unit floor area). It is therefore possible that the living room widows may be open, and comply with relevant criteria, meanwhile providing the outside air source for the bedrooms at the same time.

This is reasonable, given that the living areas comply with windows open for natural ventilation. If air for the bedrooms were sourced from the living area, the internal noise level within all areas of the development would be in compliance with the recommendations of 'Development near Rail Corridors and Busy Roads'.

7. RAILWAY VIBRATION

Trains induce ground borne vibration that is transmitted through the subsoil. This vibration can be perceptible close to railways.

7.1 OBJECTIVES

7.1.1 Consent Conditions

Vibration levels such as the intermittent vibration emitted by trains should comply with the criteria in *Assessing Vibration: a technical guideline* (DECC 2006). The standards used for assessing the risk of vibration damage to structures are German Standard DIN 4150 Part 3 1999 and British Standard BS 7385 Part 2 1993. Human comfort is normally assessed with reference to the above British Standard or Australian Standard AS 2670.2 1990. In terms of human comfort, Assessing Vibration: A Technical Guideline is based on British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)".

7.1.2 Project criteria

The requirements of British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)" forms the basis of the Interim Guidelines as this standard includes guidance for the assessment of human response to building vibration including intermittent vibrations such as that caused by trains.

Human response to vibration has been shown to be biased at particular frequencies, which are related to the orientation of the person. This standard provides curves of equal annoyance for various orientations. These curves are applied as correction filters such that an overall weighted acceleration level is obtained. As the orientation of the resident is unknown or varying the weighting filter used is based on the combined base curve as given in ISO 2631 & Australian Standard 2670 "Evaluation of Human Exposure to Vibration and Shock in Buildings (1 to 80Hz)" which represents the worst case of the X, Y and Z axes. Filtered measurements are made in all three co-ordinate axes and the highest value axis used.

This standard assesses the annoyance of intermittent vibration by using the Vibration Dose Value (VDV). Alternatively the VDV may be estimated by the eVDV which is derived by a simpler calculation using an empirical factor. The VDV or eVDV is calculated for the two periods of the day being the "Daytime" (6am-10pm) and "Night time" (10pm-6am). The overall value is then compared to the levels in Table 5. For this project the aim will be for the preferred value.

Table 5 – Vibration Dose Values ($m/s^{1.75}$) in residential buildings

Place	Preferred Value	Maximum Value
Residential buildings 15hr day	0.2	0.4
Residential buildings 9hr night	0.1	0.2

7.1.3 Regenerated Noise

The rail structure borne noise level objective will be based on the noise level recommended by the Interim Guidelines. That is, resulting structure borne noise level within proposed residential spaces should not exceed 40 dB(A) L_{max}. At this level, structure radiated noise levels would be audible but not excessively intrusive. As a direct line of sight exists between the railway lines and the potentially worst affected receiver from regenerated noise, airborne noise associated with a train passby will mask structure borne noise and treatment of airborne noise will comply with the internal noise level criteria.

7.2 RAIL TRAFFIC VIBRATION MEASUREMENTS

7.2.1 Measurement Location

Rail noise measurements were conducted in line with the proposed Walker Street facades for Lot 100 which is nearest to the railway lines and representative of the vibration levels incident on Lots 101 and 102

7.2.2 Time of Measurements

Manned measurements were conducted on 1 December 2005. As movements on the rail line have not changed, these measurements remain representative of the current site vibration exposure.

7.2.3 Measurement Equipment

Svan 912 AE Sound Analyser was used for the vibration measurements. The analyser was connected to a SV08 four channel input module fitted with a Dytran triaxial accelerometer.

7.2.4 Measurement results: Vibration Dose Values

The maximum train passby ground vibration acceleration, the typical passby period (gained from both the noise and vibration measurements) and the estimated number of train passbys were used calculate the overall VDV values for each period of the day. The results are presented in Table 6

Table 6 – Vibration Dose Values

Time Period	Calculated VDV $m/s^{1.75}$	Preferred Criteria VDV $m/s^{1.75}$	Complies
Day (7am – 10pm)	0.07	0.2	Yes
Night (10pm -7am)	0.06	0.1	Yes

The Vibration Dose Values were found to be within acceptable levels for Lot 101 and 102.

8. CONCLUSION

This report provides the results of an assessment train noise and vibration intrusion into the proposed residential development at Lots 101 and 102, Rhodes Peninsula.

Noise and vibration levels at the site have been measured and assessed in accordance with the requirements of the Department of Planning *Development Near Rail Corridors or Busy Roads – Interim Guideline* requirements. Provided the recommendations in the report are implemented the proposed development will comply with the nominated assessment criteria.

We trust this information is satisfactory. Please contact us should you have any further queries.

Report prepared by,

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