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Prepared for: Meriton Apartments

LOT 101, 102 & 104, 42 WALKER ST, RHODES (ALLIED FEEDS)

REMEDICATION, EXCAVATION AND CONSTRUCTION - NOISE AND VIBRATION MANAGEMENT PLAN

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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	1
2. INTRODUCTION	1
3. HOURS OF WORK	1
4. POTENTIALLY IMPACTED RECEIVERS	1
5. CONSTRUCTION NOISE AND VIBRATION OBJECTIVES	3
5.1 NOISE	3
5.2 VIBRATION CRITERIA	4
5.2.1 Assessing Amenity	5
5.2.2 Damage limits	5
6. MITIGATION METHODS THAT WOULD BE APPLIED TO MANAGE NOISE EMISSIONS	6
6.1 NOISE CONTROL METHODS	6
6.1.1 Selection of Alternate Appliance or Process	6
6.1.2 Acoustic Barriers	6
6.1.3 Silencing Devices	6
6.1.4 Material Handling	6
6.1.5 Treatment of Specific Equipment	6
CONTROL OF NOISE FLOW CHART	7
6.1.6 Establishment of Site Practices	8
6.1.7 Strategic Positioning of Processes On-Site	8
6.1.8 Combination of Methods	8
6.1.9 Establishment of Direct Communication with Affected Parties	8
6.1.10 Management Training	8
7. NOISE ASSESSMENT AND SPECIFIC MITIGATION METHODS TO BE APPLIED	9
7.1 GENERAL	9
7.2 NOISE EMISSION LEVELS	10
7.3 PREDICTED IMPACTS	11
8. VIBRATION	17
9. COMPLAINTS HANDLING	17
10. NOISE MONITORING	18
11. CONCLUSION	18

1. EXECUTIVE SUMMARY

The Management Plan outlines the development of controls that would be applied to all activity on the sites by the excavation and construction contractors. The objective of these controls is to ensure that all work is carried out in a highly controlled and predictable manner that will minimise emissions and protect the amenity of the sensitive receivers surrounding the site.

2. INTRODUCTION

This document presents the excavation and construction noise and vibration plan that will be used to manage noise and vibration from the Lot 101, 102 & 104 site; bounded by Lot 100, 103 and Billbergia site, Rhodes. The site is indicated in Figure 1.

This includes decommissioning works associated with site remediation, and subsequent civil works, which will be undertaken by Thiess. (These works would be managed in accordance with a DECC approved management plan). The plan also encompasses future construction activities on the Meriton sites.

3. HOURS OF WORK

It is assumed that construction operating hour limits would be imposed would be imposed in the approval conditions similar to standard construction hours such as 7am to 6pm Monday to Fridays, and 8am to 1pm Saturdays except in emergency situations where required to ensure safety is maintained.

4. POTENTIALLY IMPACTED RECEIVERS

The potentially impacted receivers have been identified as follows:

- Future occupants of Lot 100.
- Existing residential dwellings to the East in Rhodes.



5. CONSTRUCTION NOISE AND VIBRATION OBJECTIVES

5.1 NOISE

The applicable guidelines and standards are:

- Proposed consent conditions related to noise emissions provides a response level of 81 dB(A) L_{eq} (15min) which should not be exceeded. All reasonable and feasible measures should be implemented to prevent such events, or where all feasible and reasonable engineering measures are in place, implement other measures to mitigate any impacts.
- Proposed consent conditions related to noise emissions requires noise emissions to be minimised to the extent that it is reasonable and feasible. DECC Noise Draft Construction Noise and Vibration Guideline. This guideline nominates goals for noise and vibration emissions above the background noise level. The noise goal is 10 dB(A) above background, with all reasonable and feasible measures being taken to achieve this goal. Vibration goals to prevent loss of amenity and to protect adjacent structures depend on nature of vibration produced in accordance with DECC "Assessing Vibration: A Technical Guideline" (Feb 2006).
- Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site". In particular, the requirements stipulated in Section 3 of the standard will be followed.

Section 3 of AS 2436 states that care shall be taken in applying criteria that normally would be used to regulate noise emitted from industrial, commercial and residential premises to construction, particularly for those activities which are transitory and of short duration. For the control and regulation of noise from construction sites AS2436 nominates the following:

- That reasonable suitable noise criterion is established.
- That all practicable measures be taken on the building site to regulate noise emissions, including the siting on noisy static processes parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

Based on these the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction and earthwork activities at the sensitive receivers.
- If noise levels exceed "background + 10 dB(A)" noise goal at sensitive receiver locations, investigate and implement all practical and cost effective techniques to limit noise emissions.
- If the response level is still exceeded after applying all reasonable and feasible engineering controls to limit noise emissions investigate management and other techniques to mitigate noise emissions.

The table below provides a summary of the criteria applicable to the project site based on the information documented above and the background noise level determined from current and historic ambient noise monitoring.

Table 1 – External Noise Objectives for Residential Receivers In Lot 100

Daytime Background Noise Level dB(A) L_{90}	Daytime Noise Goal dB(A) L_{eq}	Response Noise Objective dB(A) L_{eq}
48	58	81

5.2 VIBRATION CRITERIA

It is proposed to adopt the following vibration guidelines, namely:

- German Standard DIN 4150-3 (1999-02): “*Structural Vibration – Effects of Vibration on Structures*” – which will be used to assess and limit building damage risk.
- DECC (Draft) Construction Noise Guideline – which contains guidelines to assess and limit impacts on building occupant’s amenity.

The criteria and the application of this standard are discussed in separate sections below.

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 1.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 2 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

5.2.1 Assessing Amenity

On occupied levels of the building, for the type of vibration producing activities proposed, vibration induced within the adjacent buildings is likely to impact amenity well before the damage limits are reached.

The DECC (Draft) Construction Noise Guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings. The recommendations of this guideline should be adopted to assess and regulate vibration within Lot 100.

5.2.2 Damage limits

Project specific vibration limits have been developed based on:

- The recommendations in Table 2.
- The vibration sources producing the highest vibration levels would not generate significant vibration at frequencies of less than 10Hz.
- The appropriate vibration limit for the building is 40 mm/s.

6. MITIGATION METHODS THAT WOULD BE APPLIED TO MANAGE NOISE EMISSIONS

6.1 NOISE CONTROL METHODS

The determination of appropriate noise control measures will be dependant on the particular activities and excavation and construction appliances. This section provides an outline of available methods.

6.1.1 Selection of Alternate Appliance or Process

Where a particular activity or appliance is found to generate noise levels that exceed the criteria, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. By carrying this activity by use of pneumatic hammers, bulldozers ripping and/or milling machines lower levels of noise will result.

6.1.2 Acoustic Barriers

Barriers or screens can be an effective means of reducing noise. Barriers can be located either at the source or receiver.

The placement of barriers at the source is generally only effective for static plant (tower cranes). Placing barriers at the source cannot effectively attenuate equipment which is on the move or working in rough or undulating terrain.

Barriers can also be placed between the source and the receiver. The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(A) may be achieved. Where the barrier does not obstruct line of sight, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance which is approximately 10 dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10 or 15mm plywood would be acceptable for the barriers.

6.1.3 Silencing Devices

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

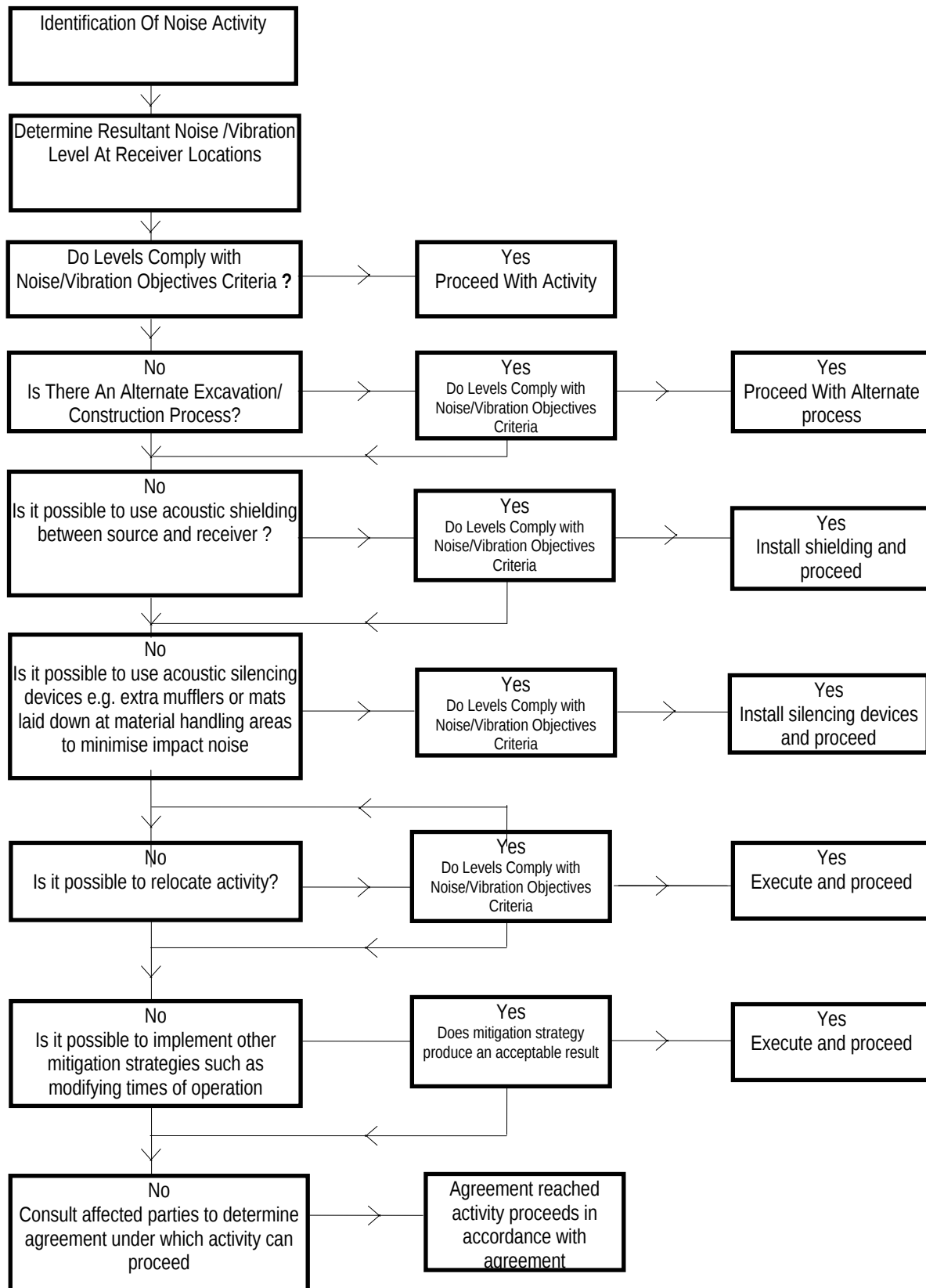
6.1.4 Material Handling

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

6.1.5 Treatment of Specific Equipment

In certain cases it may be possible to specially treat a piece of equipment to reduce the sound levels emitted. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

CONTROL OF NOISE FLOW CHART



6.1.6 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. This includes locating fixed plant items as far as possible from residents as well as rotating plant and equipment to provide respite to receivers.

Construction vehicles accessing the site should not queue in residential streets and should only use the designated construction vehicle routes. Loading of these vehicles should occur as far as possible from any sensitive receiver.

6.1.7 Strategic Positioning of Processes On-Site

Where practicable, particular processes of activities can be located in particular positions on site to minimise noise to surrounding sensitive receivers.

For example, stationary plant may be positioned where direct line of sight shielding can be achieved using natural barriers, or may maximise the distance to the nearest sensitive receiver. This may also be applicable to the building structures where the façade closest to residential receivers is left until last to provide barrier screening for the construction of the other parts of the building.

6.1.8 Combination of Methods

In some cases it may be necessary that two or more control measures be implemented to minimise noise emissions.

6.1.9 Establishment of Direct Communication with Affected Parties

In order for any construction noise management programme to work effectively, continual communication is required between all parties that may be potentially impacted upon, the builder and the regulatory authority. This establishes a dynamic response process that allows for the adjustment of control methods and criteria for the benefit of all parties.

The objectives of the consultation process are to:

- Inform and educate the groups about the project and the noise controls being implemented.
- Increase understanding of all acoustic issues related to the project and the options available.
- Identify group concerns generated by the project, so that they can be addressed.

In the event that it is predicted that certain processes may not be able to feasibly and reasonably meet the response limit, a leaflet drop to the potentially impacted receivers should be undertaken to advise them of this, provide general details of the work to be carried out, the expected duration of the work and the proposed additional mitigation methods (e.g. respite periods).

The results of noise monitoring, investigation, complaints, etc should be kept on site or otherwise made available to interested parties.

6.1.10 Management Training

All site managers should be made aware of noise and vibration limits, applicable control measures and methods. They should ensure that all agreed noise and vibration measures are carried out by employees and sub-contractors.

7. NOISE ASSESSMENT AND SPECIFIC MITIGATION METHODS TO BE APPLIED

7.1 GENERAL

An assessment of indicative noise exposure to Lot 100 and the residences in Rhodes has been undertaken which will form the basis of an initial set of recommendations to limit of noise and vibration emissions as required by the management plan. Recognising that planning for future construction activities on the sites 101, 102, 103B and 104 are either preliminary or have not yet commenced, these recommendations would be reviewed and modified as required in response to the actual construction methods used, site conditions, complaints, etc.

Construction on Lot 103 is in an advanced stage with the façade being installed and works being limited to mostly internal fitout activities. The only major external activities would be landscaping activities using relatively small machinery (Bobcats, for example). Noise emissions are unlikely to reach the nominated response level.

It is proposed to construct lots 101 and 104 prior to the remaining lots. Therefore, noise impact from the remaining lots to Lot 100 will not be significant due to the additional distance and additional screening provided by the constructed buildings.

Based on the above the following would be assessed in detail:

- Impact of demolition and excavation of lots Lots 101, 102 and 104 and the construction of Lots 101 and 104 on Lot 100.
- Impacts of Lots 101, 102 and 104 on Existing Rhodes Residences
- Impact of works to parcel of land to the north of Lot 100 on Lot 100.

Noise predictions assume that a construction hoarding along the Walker Street boundary would be maintained to act as a noise barrier to the Rhodes residences to the east of the site.

7.2 NOISE EMISSION LEVELS

The following noise emission levels were used in the predictions.

Table 3 - Sound Power Levels – Construction Plant

EQUIPMENT	SOUND POWER LEVEL - dB(A)
140 Grader	110
150mm Dewatering Pump	107
25 T Dump Truck	108
30 T Excavator	110
850 Compactor	115
Backhoe	102
D10 Bulldozer + Ripper	112
Concrete Pump	112
Water Cart	108
Angle grinder	114
Electrical saw	111
Drill	94
Tower Crane	110
Mobile Crane	108
Hammering	110

The noise levels presented in the above table for earthmoving equipment are derived from the Noise Management Plan prepared by Thiess Services.

7.3 PREDICTED IMPACTS

The following table summarises the anticipated impacts and the proposed noise control /mitigation methods. It is noted that the assessment is based on preliminary information available and will be refined and updated as more detailed/relevant information becomes available. The following has been predicted:

- Impacts to Lot 100 have been assessed from demolition on Lots 101 and 102, earthworks on Lots 101, 102 and 104, and construction on Lots 101 and 104.
- Impacts to existing Rhodes residences to the East have been assessed from demolition on Lots 101 and 102, earthworks on Lots 101, 102 and 104, and construction on Lots 101 and 104.
- Impacts from the construction of the park to the north of Lot 100 have been assessed to Lot 100.

The following is noted:

- Noise impacts from the construction of Lot 102 have not been assessed at Lot 100 given that Lots 101 and 104 would be constructed and would screen Lot 100 from any significant noise from Lot 102.
- Noise impacts from the construction of Lots 101 and 104 on Lot 100 will generate similar worst case noise levels. However, Lot 104 construction will generally have a lower overall impact given that the noise sources will for the most part be further away from Lot 100 and the amount of exposed façade on Lot 100 would be less.
- The noise predictions for demolition and excavation include Lot 102 although the higher noise levels would generally be as a result of activities on Lot 101.

Table 4 – Predicted Noise Exposure and Proposed Control/Mitigation Methods

Scenario	Stage	Typical Equipment	Expected Noise Levels dB(A) L_{eq} (15 min)	Comments/Proposed Control/Mitigation Methods
Lots 101 and/or Lot 104 to Lot 100	Demolition (8 weeks)	Excavator (also with pulveriser), bulldozer, trucks, mobile crane (includes Lot 102)	Noise levels outside most affected façade will vary from approximately 83 dB(A) when the louder equipment is operating close to the Lot 100 boundary to around 64 dB(A) when operating on the far side of the site.	Demolition phase likely to take less than 1 month to complete. Works only occur during normal working hours when many units will be unoccupied. Units are air conditioned and internal noise levels with windows closed will be approximately 25 dB(A) lower. Barriers will be ineffective due to elevated receivers. Treatment of equipment not practical due to limited time on site/availability of existing plant. No or limited use of hammers. Limit works generating more than 81 dB(A) (i.e. close to Lot 100 boundary) to 50% of day.
	Excavation (6 weeks)	Excavator, bulldozer, trucks (includes Lot 102)	Noise levels outside most affected façade will vary from approximately 83 dB(A) when the louder equipment is operating close to the Lot 100 boundary to around 64 dB(A) when operating on the far side of the site.	No or limited rock excavation with hammers. Works only occur during normal working hours when many units will be unoccupied. Units are air conditioned and internal noise levels with windows closed will be approximately 25 dB(A) lower. Barriers will be ineffective due to elevated receivers. Treatment of equipment not practical due to limited time on site/availability of existing plant. Limit works generating more than 81 dB(A) (i.e. close to Lot 100 boundary) to 50% of day.

Table 4 – Predicted Noise Exposure and Proposed Control/Mitigation Methods (ctd)

Scenario	Stage	Typical Equipment	Expected Noise Levels dB(A) L_{eq} (15 min)	Comments/Proposed Control/Mitigation Methods
Lots 101 and/or Lot 104 to Lot 100	Structure (9 to 12 months per site)	Concrete truck and pump, concrete vibrators and levellers, formwork erection and removal, crane.	With the control strategies in place noise levels will be less than 81 dB(A) outside Lot 100 during the loudest periods, but typically less than 70 dB(A) externally and 45 dB(A) internally with windows closed.	Works only occur during normal working hours when many units will be unoccupied. Units are air conditioned and internal noise levels with windows closed will be approximately 25 dB(A) lower. In most cases barriers will be ineffective due to elevated receivers, except for stationary plant such as concrete pump and dewatering pump. Locate stationary pumps as far as practical from sensitive receivers with Partial enclosure or barrier to be provided to sensitive receivers. Locate tower crane as far as possible from sensitive receivers. Upgrade muffler and install plywood barrier around engine. Limit works generating more than 81 dB(A) (i.e. close to Lot 100 boundary) to 50% of day.
	Fitout (9 to 15 months per site)	Hand tools, crane, hoist	With the control strategies in place noise levels will be generally less than 70 dB(A) externally and 45 dB(A) internally with windows closed. Noise Levels not expected to exceed response level	Works only occur during normal working hours when many units will be unoccupied. Units are air conditioned and internal noise levels with windows closed will be approximately 25 dB(A) lower. When façade installed undertake noisy internal activities with windows closed where possible.
	Landscaping/External Works (3 months per site)	Trucks, bobcat	Noise levels outside Lot 100 expected to vary between 54 dB(A) and 68 dB(A) depending on location of plant on the site	Works only occur during normal working hours when many units will be unoccupied. Units are air conditioned and internal noise levels with windows closed will be approximately 25 dB(A) lower. Treatment of equipment not practical due to limited time on site/availability of existing plant.

Table 4 – Predicted Noise Exposure and Proposed Control/Mitigation Methods (ctd)

Scenario	Stage	Typical Equipment	Expected Noise Levels dB(A) L_{eq} (15 min)	Comments/Proposed Control/Mitigation Methods
Lots 101 and/or Lot 104 to Existing Rhodes Residential	Demolition (8 weeks)	Excavator (also with pulveriser), bulldozer, trucks, mobile crane (includes Lot 102)	Noise levels will vary from approximately 55 up to 63 dB(A) when the louder equipment is operating close to the eastern boundary.	Demolition phase likely to take less than 1 month to complete. Works only occur during normal working hours when many units will be unoccupied. Barrier provided by hoarding on eastern boundary of Meriton Site. Treatment of equipment not practical due to limited time on site/availability of existing plant. No or limited use of hammers.
	Excavation (6 weeks)	Excavator, bulldozer, trucks (includes Lot 102)	Noise levels will vary from approximately 55 up to 63 dB(A) when the louder equipment is operating close to the eastern boundary.	No or limited rock excavation with hammers. Works only occur during normal working hours when many houses will be unoccupied. Barrier provided by hoarding on eastern boundary of Meriton Site. Treatment of equipment not practical due to limited time on site/availability of existing plant.

Table 4 – Predicted Noise Exposure and Proposed Control/Mitigation Methods (ctd)

Scenario	Stage	Typical Equipment	Expected Noise Levels dB(A) L_{eq} (15 min)	Comments/Proposed Control/Mitigation Methods
Lots 101 and/or Lot 104 to Existing Rhodes Residential	Structure (9 to 12 months per site)	Concrete truck and pump, concrete vibrators and levellers, formwork erection and removal, crane.	Noise levels will vary from approximately 55 up to 63 dB(A) when the louder equipment is operating close to the eastern boundary.	Works only occur during normal working hours when many houses will be unoccupied. Barrier provided by hoarding on eastern boundary of Meriton Site. Locate stationary pumps as far as practical from sensitive receivers with Partial enclosure or barrier to be provided to sensitive receivers. Locate tower crane as far as possible from sensitive receivers. Upgrade muffler and install plywood barrier around engine.
	Fitout (9 to 15 months per site)	Hand tools, crane, hoist.	With the control strategies in place noise levels will be generally less than 58 dB(A) externally.	Works only occur during normal working hours when many units will be unoccupied. When façade installed undertake noisy internal activities with windows closed where possible.
	Landscaping/External Works (3 months per site)	Trucks, bobcat	Noise levels expected to be less than 58 dB(A).	Works only occur during normal working hours when many units will be unoccupied. Treatment of equipment not practical due to limited time on site/availability of existing plant.

Table 4 – Predicted Noise Exposure and Proposed Control/Mitigation Methods (ctd)

Scenario	Stage	Typical Equipment	Expected Noise Levels dB(A) L_{eq} (15 min)	Comments/Proposed Control/Mitigation Methods
Site North of Lot 100 to Lot 100	Excavation (4 weeks)	Excavator, bulldozer, trucks	Noise levels will vary from approximately 81 dB(A) when the louder equipment is operating close to the Lot 100 boundary to around 68 dB(A) when operating on the far side of the site.	No or limited rock excavation with hammers. Works only occur during normal working hours when many units will be unoccupied. Units are air conditioned and internal noise levels with windows closed will be approximately 25 dB(A) lower. Barriers will be ineffective due to elevated receivers. Treatment of equipment not practical due to limited time on site/availability of existing plant. Limit works generating more than 81 dB(A) (i.e. close to Lot 100 boundary) to 50% of day.
	Landscaping/External Works (6 weeks)	Trucks, bobcat	Noise levels expected to vary between 54 dB(A) and 68 dB(A) depending on location of plant on the site	Works only occur during normal working hours when many units will be unoccupied. Units are air conditioned and internal noise levels with windows closed will be approximately 25 dB(A) lower. Treatment of equipment not practical due to limited time on site/availability of existing plant.

8. VIBRATION

To regulate vibration emanating from both the excavation and construction processes and ensure the vibration levels comply with the criteria above the excavation and construction contractors will need to operate particular machinery at certain distance from affected buildings to comply within the criteria. The following is an estimate of the distances that may be required for the various equipments.

Piling

Bored or CFA piling shall be 5m from brick/masonry service authority structure.

Ripping

10m from nearest residence.

Milling and Grinding

No limit from nearest residence.

9. COMPLAINTS HANDLING

A register of noise complaints should be maintained within the site office and be made available to interested parties listing the source of the complaint, time and nature of the complaint.

A nominated responsible person e.g. site manager) should be appointed to receive and act on complaints received. A sign clearly indicating the site contact number for any complaints should be erected and maintained over the life of the project. It would be the responsibility of the nominated person to ensure all actions required following the registration of a complaint are completed and the complaint resolved.

The following procedure should be adopted where complaints are received.

- The particular activity causing the complaint should be suspended pending further investigation.
- Noise/vibration levels from the activity should be established either by examining data obtained from an unattended monitor or by specific attended monitoring of the activity carried out on a trial basis.
- Where monitoring indicates that the noise or vibration emission response level is exceeded then additional engineering or management controls should be investigated in accordance with the management plan.
- The activity should proceed with the additional mitigation methods in place and the resultant noise impact reassessed.
- A written record of the subsequent investigation and additional safeguards implemented should be documented and confirmed to all operators to be included in their operational plans. The noise management plan should be appended to include any additional requirements arising from complaints received.

10. NOISE MONITORING

An unattended noise monitor shall be located on or near the southern boundary of Lot 100 to monitor noise emissions from a) remediation/demolition/excavation of Precinct C, b) from construction activities on Lots 101 and 104 where these are likely to exceed exceeding 58 dB(A) externally at Lot 100 and c) while Lednez remediation occurs.

The logger shall be downloaded fortnightly, or in response to complaints, and a report provided.

Additional attended monitoring should be undertaken in response to complaints.

Meriton Apartments Pty Limited will notify the Director-General and Council of an exceedence of the Response Level in Table 5 as soon as practicable after of the exceedence. Meriton Apartments Pty Limited will provide written details of the notification to the Director-General and Council within 7 days of the date on which the exceedence occurred and, as a minimum, include the following in the written notification:

- the cause, time and duration of the event;
- action taken in relation to the event; and
- details of the additional noise mitigation measures implemented to prevent a recurrence of such an event or mitigate a similar event.

11. CONCLUSION

The finding of this document indicates that noise levels and vibration levels from the excavation/ construction activities taking place on the Lot101, 102 and 104 will comply with the criteria nominated in Section 4 of this report at all times, provided times of operation indicated in this document and the recommendations are observed.

Vibration levels from excavation and construction activities will fully comply with the vibration criteria nominated in Section 6, provided the recommendations in this document are observed.

Report prepared by,



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