ACOUSTICS AND AIR

BUNNINGS LEPPINGTON WAREHOUSE DEVELOPMENT

NOISE & AIR QUALITY ASSESSMENT

REPORT NO. 19268
VERSION A

OCTOBER 2019

PREPARED FOR

BUNNINGS GROUP LIMITED
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ROSEHILL NSW 2142

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DOCUMENT CONTROL

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TABLE OF CONTENTS

GLOSSARY OF AIR QUALITY TERMS

Air Pollution – The presence of contaminants or pollutant substances in the air that interfere with human health or welfare or produce other harmful environmental effects.

Air Quality Standards – The level of pollutants prescribed by regulations that are not to be exceeded during a given time in a defined area.

Air Toxics – Any air pollutant for which a national ambient air quality standard (NAAQS) does not exist (i.e. excluding ozone, carbon monoxide, PM_{10}, sulphur dioxide, nitrogen oxide) that may reasonably be anticipated to cause cancer; respiratory, cardiovascular, or developmental effects; reproductive dysfunctions, neurological disorders, heritable gene mutations, or other serious or irreversible chronic or acute health effects in humans.

Airborne Particulates – Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Sources of airborne particulates include dust, emissions from industrial processes, combustion products from the burning of wood and coal, combustion products associated with motor vehicle or non-road engine exhausts, and reactions to gases in the atmosphere.

Area Source – Any source of air pollution that is released over a relatively small area, but which cannot be classified as a point source. Such sources may include vehicles and other small engines, small businesses and household activities, or biogenic sources, such as a forest that releases hydrocarbons, may be referred to as nonpoint source.

Concentration – The relative amount of a substance mixed with another substance. Examples are 5 ppm of carbon monoxide in air and 1 mg/l of iron in water.

Emission – Release of pollutants into the air from a source. We say sources emit pollutants.

Emission Factor – The relationship between the amount of pollution produced and the amount of raw material processed. For example, an emission factor for a blast furnace making iron would be the number of pounds of particulates per ton of raw materials.

Emission Inventory – A listing, by source, of the amount of air pollutants discharged into the atmosphere of a community; used to establish emission standards.

Flow Rate – The rate, expressed in gallons or litres-per-hour, at which a fluid escapes from a hole or fissure in a tank. Such measurements are also made of liquid waste, effluent, and surface water movement.

Fugitive Emissions – Emissions not caught by a capture system.

Hydrocarbons (HC) – Chemical compounds that consist entirely of carbon and hydrogen.

Hydrogen Sulphide (H_2S) – Gas emitted during organic decomposition. Also, a by-product of oil refining and burning. Smells like rotten eggs and, in heavy concentration, can kill or cause illness.

Inhalable Particles – All dust capable of entering the human respiratory tract.

Nitric Oxide (NO) – A gas formed by combustion under high temperature and high pressure in an internal combustion engine. NO is converted by sunlight and photochemical processes in ambient air to nitrogen oxide. NO is a precursor of ground-level ozone pollution, or smog.

Nitrogen Dioxide (NO_2) – The result of nitric oxide combining with oxygen in the atmosphere; major component of photochemical smog.

Nitrogen Oxides (NO_x) – A criteria air polluant. Nitrogen oxides are produced from burning fuels, including gasoline and coal. Nitrogen oxides are smog formers, which react with volatile organic compounds to form smog. Nitrogen oxides are also major components of acid rain.

Mobile Sources – Moving objects that release pollution; mobile sources include cars, trucks, buses, planes, trains, motorcycles and gasoline-powered lawn mowers.

Particulates; Particulate Matter (PM_{10}) – A criteria air pollutant. Particulate matter includes dust, soot and other tiny bits of solid materials that are released into and move around in the air. Particulates are produced by many sources, including burning of diesel fuels by trucks and buses, incineration of garbage, mixing and application of fertilizers and pesticides, road construction, industrial processes such as steel making, mining operations, agricultural burning (field and slash burning), and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose and throat irritation and other health problems.

Parts Per Billion (ppb)/Parts Per Million (ppm) – Units commonly used to express contamination ratios, as in establishing the maximum permissible amount of a contaminant in water, land, or air.

PM_{10}/$PM_{2.5}$ – PM_{10} is measure of particles in the atmosphere with a diameter of less than 10 or equal to a nominal 10 micrometers. $PM_{2.5}$ is a measure of smaller particles in the air.

Point Source – A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; eg. a pipe, ditch, ship, ore pit, factory smokestack.

Scrubber – An air pollution device that uses a spray of water or reactant or a dry process to trap pollutants in emissions.

Source – Any place or object from which pollutants are released.

Stack – A chimney, smokestack, or vertical pipe that discharges used air.

Stationary Source – A place or object from which pollutants are released and which does not move around. Stationary sources include power plants, gas stations, incinerators, houses etc.

Temperature Inversion – One of the weather conditions that are often associated with serious smog episodes in some portions of the country. In a temperature inversion, air does not rise because it is trapped near the ground by a layer of warmer air above it. Pollutants, especially smog and smog-forming chemicals, including volatile organic compounds, are trapped close to the ground. As people continue driving and sources other than motor vehicles continue to release smog-forming pollutants into the air, the smog level keeps getting worse.

GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

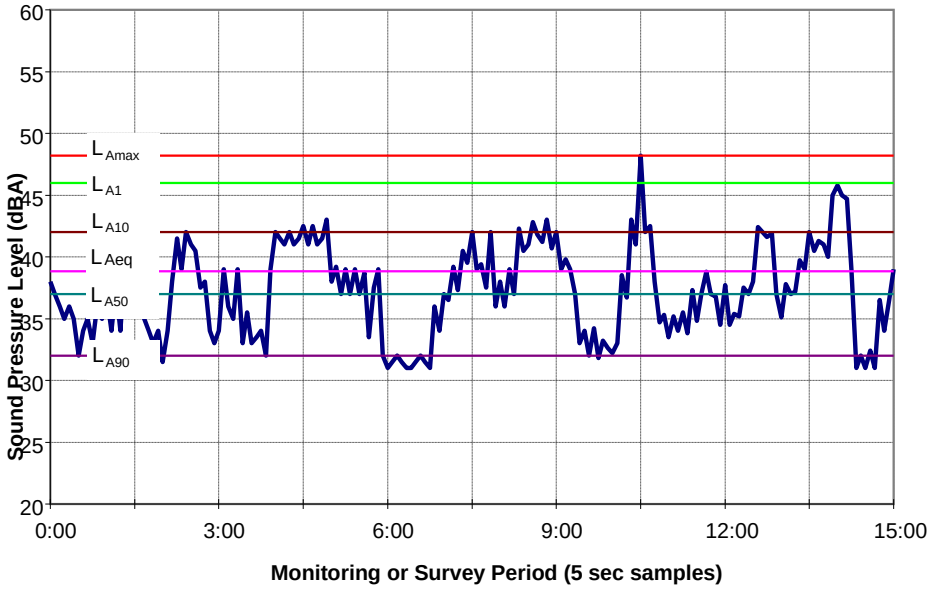
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening, and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Wilkinson Murray has been engaged by Bunnings, to provide an assessment of potential operational noise impacts associated with a proposed Bunnings Warehouse at Bringelly Road Business Hub. It accompanies an environmental impact statement (EIS) prepared in support of State Significant Development Application SSD 10366.

This assessment responds to the issue raised in item 8 of the SEARs as follows:

5. Noise and Vibration – including:

- *a quantitative noise and vibration impact assessment undertaken by a suitably qualified person in accordance with the relevant Environment Protection Authority (EPA) guidelines and including an assessment of nearby sensitive receivers*
- *cumulative impacts of other developments*
- *details of proposed mitigation, management and monitoring measures*

13. Air Quality – including:

- *a description of all air quality impacts (including dust) from the proposal, particularly from the outdoor storage area*
- *details of dust control during site preparation and civil works.*

Relevant Policies & Guidelines:

- *Interim Construction Noise Guideline (DECC)*
- *Assessing Vibration: a technical guide (DEC)*
- *NSW Noise Policy for Industry 2017 (EPA)*
- *Environmental Criteria for Road Traffic Noise (EPA)*
- *Noise Guide for Local Government (EPA)*
- *Protection of the Environment Operations (Clean Air) Regulation 2002*
- *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC)*

2 SITE DESCRIPTION

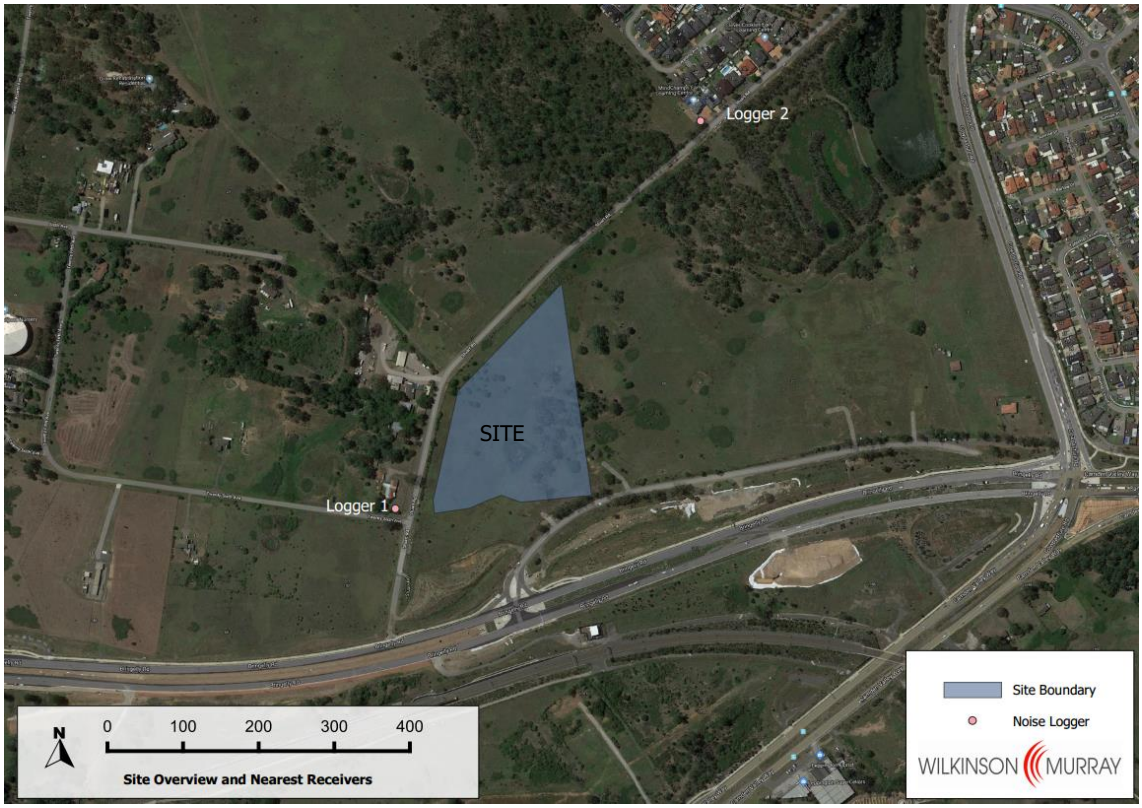
The site is situated on the northern side of Bringelly Road, Leppington. The current site is unoccupied and forms part of the Bringelly Business Hub. An aerial view is provided Figure 2-1.

The nearest residential receivers have been identified as:

- Two residences on Stuart Road immediately to the west of the site at approximately 25 – 30 metres from the proposed facility.
- Residences on Stuart Road to the north-east of the site at Number 16 Stuart Road, approximately 300 metres from the proposed facility.

In all other directions, the immediate surrounding properties are either or industrial or greenfield sites.

Figure 2-1 Aerial View of the Site Location



The configuration of the Bunnings is typical of normal Bunnings Operations and consists of:

- Main Store (Fully Enclosed);
- Nursery;
- Bagged Goods Area;
- Timber Trade Area (Fully Enclosed);

- Building Materials Landscape Yard (Fully Enclosed); and
- On-grade Carpark.

Figure 2-2 and Figure 2-3 show the proposed layout.

Figure 2-2 Proposed Site Layout

Figure 2-3 Proposed Site Layout

Proposed operating times are:

- 6.00am to 10.00pm Monday to Friday; and
- 6.00am to 7.00pm Saturday & Sunday.

3 EXISTING NOISE LEVELS

Ambient noise monitoring has been conducted by SLR Consulting for the nearby CFC Distribution Facility. Monitoring was conducted for a period of a week between Thursday 9 August and Wednesday 15 August 2018 at nearby residences, as shown in Figure 2-1. Given the site is subject to construction the use of data from the SLR assessment is applicable.

Table 3-1 and Table 3-2 summarise the Rating Background Level (RBL) values derived from data collected during the unattended noise monitoring (RBL is a standard measure of background noise which is defined in the EPA's *Noise Policy for Industry*). Noise charts of the logged data are presented in Appendix A.

Table 3-1 Measured Ambient Noise Levels, Location 1 – Twenty Sixth Avenue & Stuart Road – dBA

Noise Descriptor	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
Rating Background Level	44	43	39
$L_{Aeq\ (period)}$	53	54	49

Table 3-2 Measured Ambient Noise Levels, Location 2 – 18 Stuart Road, West Hoxton – dBA

Noise Descriptor	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
Rating Background Level	39	36	31
$L_{Aeq\ (period)}$	53	51	48

In addition are review of noise data indicates the following indicative RBL for the should period between 6.00am and 7.00am.

- Location 1: 50dBA
- Location 2: 44dBA

4 CONSTRUCTION NOISE & VIBRATION ASSESSMENT

This section of the assessment relates to Stage 1 works, whereby other stages of the development will be assessed when applications are made for these works. It should be noted that the noise and vibration criteria detailed in the following sections is applicable to all stages of the Masterplan.

4.1 Construction Noise Criteria

The following sections detail the applicable site-specific noise and vibration criteria based on the EPA *Interim Construction Noise Guideline*.

4.1.1 Construction Noise Management Levels

The EPA released the *Interim Construction Noise Guideline (ICNG)* in July 2009. The guideline provides noise goals that assist in assessing the impact of construction noise.

For residences, the daytime construction noise goal is that the $L_{Aeq,15min}$ noise management level should not exceed the background noise by more than 10dBA. This is for standard hours: Monday to Friday 7.00am to 6.00pm, and Saturday 8.00am to 1.00pm. Outside the standard hours, where construction is justified, the noise management level would be background + 5dBA. Table 4-1 details the *ICNG* noise management levels.

Table 4-1 Construction Noise Management Levels at Residences using Quantitative Assessment

Time of Day	Management Level $L_{Aeq,(15min)}$	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL + 10dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.

Time of Day	Management Level $L_{Aeq,(15min)}$	How to Apply
Outside recommended standard hours	Noise affected RBL + 5dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see Section 7.2.2.

In addition, the following construction noise management levels $L_{Aeq,15min}$ are recommended for other receivers and areas:

- Industrial premises: external $L_{Aeq,15min}$ 75dBA
- Offices, retail outlets: external $L_{Aeq,15min}$ 70dBA

Based on the above, Table 4-2 presents the applicable noise management levels for construction activities at surrounding receivers that have been adopted for all applications.

Table 4-2 Site-Specific Construction Noise Management Levels

Area	Construction Noise Management Level, L_{Aeq} – dBA				Highly noise affected Noise Level, L_{Aeq} dBA
	Day	Evening	Night	Saturday*	
1 – Stuart Road	54	48	44	54	75
2 – West Hoxton	49	40	36	44	75

Note: * Standard Saturday construction hours.

4.2 Proposed construction hours

The proposed construction working hours for this project are as follows:

- Monday to Friday 7.00am to 7.00pm
- Saturday 8.00am to 1.00pm
- Sunday and Public Holidays No work

If required, after hours permits will be sought from the relevant authorities.

4.3 Vibration Criteria

Criteria for assessment of the effects of vibration on human comfort are set out in British Standard 6472-1992. Methods and criteria in that Standard are used to set "preferred" and "maximum" vibration levels in the document *Assessing Vibration: A Technical Guideline* (2006) produced by the NSW DECCW.

Acceptable values of human exposure to continuous vibration, such as that associated with drilling, are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence, or a vibration-critical area). Guidance on preferred values for continuous vibration is set out in Table 4-3.

Table 4-3 Criteria for Exposure to Continuous Vibration

Place	Time	Peak Particle Velocity (mm/s)	
		Preferred	Maximum
Critical working areas (e.g. hospital operating theatres precision laboratories)	Day or Night time	0.14	0.28
Residences	Daytime	0.28	0.56
	Night time	0.20	0.40
Offices	Day or Night time	0.56	1.1
Workshops	Day or Night time	1.1	2.2

In the case of intermittent vibration, which is caused by plant such as rock breakers, the criteria are expressed as a Vibration Dose Value (VDV) and are presented in Table 4-4.

Table 4-4 Acceptable Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Daytime		Night Time	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions, and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Calculation of VDV requires knowledge of the number of events, and their duration in the relevant time period.

4.3.1 Building Damage

In terms of the most recent relevant vibration damage objectives, Australian Standard AS 2187: Part 2-2006 *"Explosives – Storage and Use – Part 2: Use of Explosives"* recommends the frequency dependent guideline values and assessment methods given in BS 7385 Part 2-1993 *"Evaluation and measurement for vibration in buildings Part 2"*, as they "are applicable to Australian conditions".

The British Standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

The recommended limits (guide values) from BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in Table 4-5.

Table 4-5 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage

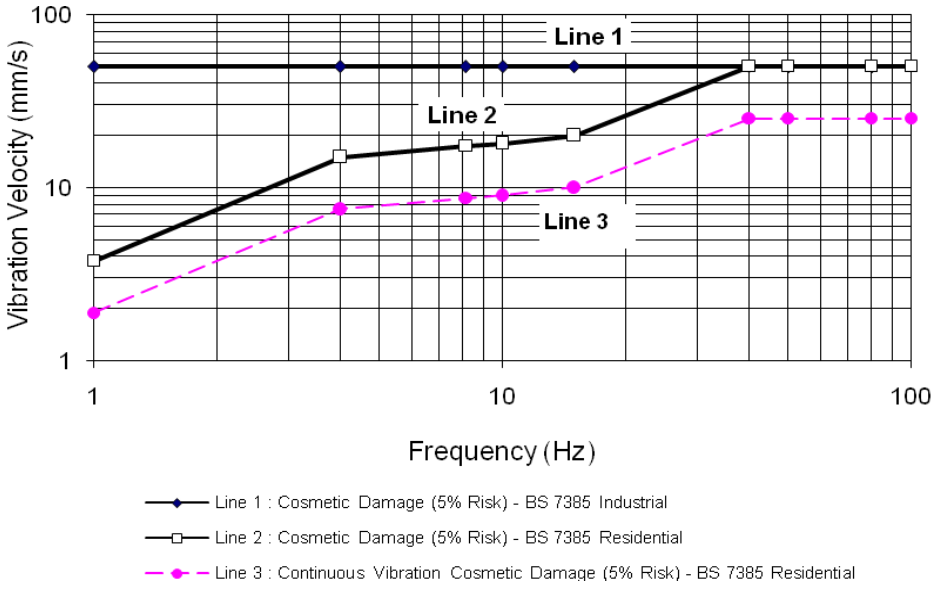
Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4 Hz and above	N/A
Un-reinforced or light framed structures Residential or light commercial type buildings	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above

The Standard states that the guide values in Table 4-5 relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings.

Note that rock breaking / hammering, and sheet piling activities are considered to have the potential to cause dynamic loading in some structures (e.g. residences) and it may therefore be appropriate to reduce the transient values by 50%.

The British Standard goes on to state that "*Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity*". In addition, a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.

Figure 4-1 Graph of Transient Vibration Guide Values for Cosmetic Damage



4.4 Construction Equipment & Noise Source Levels

Sound Power Levels (SWLs) for typical construction plant are identified in Table 4-6. These SWLs have been measured at other similar construction sites. The table gives both Sound Power Level and Sound Pressure Level (SPL) at 7m for the equipment. Sound Power Level is independent of measurement position.

Table 4-6 Typical Construction Plant Sound Levels – dBA

Plant	Sound Power Level	Sound Pressure Level at 7m
Concrete Truck	109	84
Angle Grinder	109	84
Concrete Pump – 120 mm diameter / 50 bar	112	87
Concrete Saw	116	91
Mobile Crane	98	73
Dump Truck	108	83
Concrete Pump	112	87
Compressor	100	75
Bobcat	103	78
Hand Tools	90	65
Excavator	108	83
Crawler Cranes	98	73
Tower Crane	104	79
Front End Loader	112	87
Excavator	107	82
Hammer Hydraulic	122	97
Bored Pile Rig	112	87

4.5 Construction Noise Predictions

Assessment of likely construction noise at surrounding receivers has been undertaken for the proposed construction works relating to Stage 1 works associated with the Bunnings only.

Site-related noise emissions were modeled with the "CadnaA" noise prediction program, using the ISO 9613 noise prediction algorithms. Factors that are addressed in the noise modeling are:

- equipment sound level emissions and location;
- screening effects from buildings;
- receiver locations;
- ground topography;
- noise attenuation due to geometric spreading;
- ground absorption; and
- atmospheric absorption.

Modelling has been conducted for a number of construction scenarios. The two works scenarios considered are summarised in Table 4-7.

Table 4-7 Construction Scenarios for Construction Works

Scenario	Description	Works
A	Building Construction	This scenario includes concreting and lifting. 1 concrete pump, 1 Excavator, 2 forklifts, 1 compressor, 1 crane, a boom truck and tower crane are assumed to operate in 15 minutes. Also, concrete trucks and normal delivery trucks assumed to be two movements in 15 minutes.
B	Facade / Fitout	In the event that the construction of the facade occurs in isolation. Forklift, truck, tower crane and power tools assumed. Two truck movements in 15 minutes assumed.

Noise modelling has been conducted for each of the above scenarios, with plant located across the construction site.

The modelling assumes a "typical worst-case" scenario whereby all plant, is running continuously. As such, the modelling represents likely noise levels that would occur during intensive periods of construction. Therefore, the presented noise levels can be considered in the upper range of noise levels that can be expected at surrounding receivers when the various construction scenarios occur.

Once noise sources have been applied to the model, the resultant noise levels at identified surrounding receivers are predicted. These results are then compared with established site-specific noise criteria.

Table 4-8 details results of construction noise modelling for each scenario.

Table 4-8 Predicted Construction Noise Levels at Residence – $L_{Aeq(15\ min)}$ – dBA

Residential Receiver	Predicted Noise Level	NML	Exceedance
Scenario A – Building Construction			
1 – Stuart Road	55	54	1
2 – West Hoxton	45	49	0
Scenario B – Façade / Fitout			
1 – Stuart Road	57	54	3
2 – West Hoxton	45	49	0

4.6 Discussion of Results

A review of results of construction noise indicates that noise from construction is likely to comply at those receivers at West Hoxton with minor exceedances for those closer at Stuart Road of up to 3dB.

4.7 Construction Vibration Assessment

Given that the major bulk earthworks have been completed as part of the Masterplan, vibration intensive construction techniques are not expected and, as such, the vibration impacts are expected to be insignificant.

4.8 Construction Noise & Vibration Mitigation Measures

Whilst no specific noise and vibration control management measures are required, the following "best practice" noise and vibration measures are recommended:

- *Plant Noise Audit* – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service. To this end, testing should be established with the contractor.
- *Operator Instruction* – Operators should be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission.
- *Equipment Selection* – All fixed plant at the work sites should be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures, and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with EPA guidelines.
- *Site Noise Planning* – Where practical, the layout and positioning of noise-producing plant and activities on each work site should be optimised to minimise noise emission levels.

The adoption of the above measures is aimed at working towards achieving the noise management levels established at surrounding receivers.

4.9 Community Liaison & General Approaches to Mitigation

An effective community relations programme should be put in place to keep the community that has been identified as being potentially affected appraised of progress of the works, and to forewarn potentially affected groups (e.g. by letterbox drop, meetings with surrounding owners/tenants, etc) of any anticipated changes in noise and vibration emissions prior to critical stages of the works, and to explain complaint procedures and response mechanisms. This programme should include a *Community and Stakeholder Engagement Strategy* developed specifically for the Project.

Close liaison should be maintained between the communities overlooking work sites and the parties associated with the construction works to provide effective feedback in regard to perceived emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighbouring communities, and to ensure prompt response to complaints, should they occur.

4.10 Noise & Vibration Management Plan

A Construction Noise and Vibration Management Plan for the site is recommended which should be prepared by the successful contractor. The plan should reference the findings of this assessment. Areas that should be addressed in plan include:

- noise and vibration mitigation measures;
- noise and vibration monitoring;
- response to complaints**;**
- responsibilities;
- monitoring of noise emissions from plant items;
- reporting and record keeping;
- non-compliance and corrective action; and
- community consultation and complaint handling.

5 OPERATIONAL NOISE CRITERIA

5.1 Operational Noise Criteria

The NSW *NPfI* provides a framework and process for deriving noise criteria for consents and licences that enable the EPA and others to regulate premises that are scheduled under the Protection of the Environment Operations Act 1997. Whilst specifically aimed at assessment and control of noise from industrial premises regulated by the EPA, the policy is also appropriate for use by the DP&E and local councils when assessing development proposals.

Having been designed for large industrial and agricultural sources, the monitoring and assessment procedures may not be applicable to the smaller developments and noise sources regulated by local government. It is recognised however, that councils may find the policy to be of assistance in noise assessment and land-use planning.

The *NPfI* documents a procedure for assessment and management of industrial noise which involves the following steps:

- Determining the project noise trigger levels for a development. The project noise trigger level is a benchmark level above which noise management measured are required to be considered. They are derived by considering short-term intrusiveness due to changes in the existing noise environment (applicable to residential receivers only) and maintaining noise level amenity for particular land uses for residents and other sensitive receivers.
- Predicting or measuring noise produced by the development (having regard to any associated annoying characteristics and prevailing meteorological effects).
- Comparing the predicted or measured noise level with the project noise trigger level and assessing impacts and the need for noise mitigation and management measures.
- Considering any residual noise impacts following the application of feasible and reasonable noise mitigation measures.
- Setting statutory compliance levels that reflect the best achievable and agreed noise limits for development.
- Monitoring and reporting environmental noise levels from the development.

The project noise trigger level represents the level that, if exceeded, may indicate a potential noise impact upon a community. It is a benchmark or objective and is not intended for use as a mandatory requirement.

5.1.1 Intrusiveness Noise Level

For assessing intrusiveness, the background noise level (L_{A90}) is measured and the Rating Background Level (RBL) determined. The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous noise level (L_{Aeq}) of the source (measured over a 15-minute period) does not exceed the background noise level (RBL) by more than 5dBA.

The intrusiveness criteria for each surrounding residential receiver area are presented in Table 5-1. This was calculated by adding 5dB to the RBL of the nearest long-term monitoring location, as discussed above.

Table 5-1 Intrusive Noise Criteria – $L_{Aeq,15min}$ (dBA)

Location	Noise Criterion		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-6am
1 – West Hoxton	44	40	36
2 – Stuart Road	49	47	44

5.1.2 Amenity Noise Level

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include transportation noise (when on public transport corridors), noise from motor sport, construction noise, community noise, blasting, shooting ranges, occupational workplace noise, wind farms, amplified music/patron noise.

The amenity noise level aims to limit continuing increases in noise levels which may occur if the intrusiveness level alone is applied to successive development within an area.

The recommended amenity noise level represents the objective for total industrial noise at a receiver location. The project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To prevent increases in industrial noise due to the cumulative effect of several developments, the project amenity noise level for each new source of industrial noise is set at 5dBA below the recommended amenity noise level.

The following exceptions apply to determining the project amenity noise level:

- For high-traffic areas, the amenity criterion for industrial noise becomes the $L_{Aeq,period(traffic)}$ minus 15dBA.
- In proposed developments in major industrial clusters.
- If the resulting project amenity noise level is 10dB or more lower than the existing industrial noise level, the project amenity noise level can be set at 10dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.
- Where cumulative industrial noise is not a consideration because no other industries are present in, or likely to be introduced into the area, the relevant amenity noise level is assigned as the project amenity noise level for the development.

Amenity noise levels are not used directly as regulatory limits. They are used in combination with the project intrusiveness noise level to assess the potential impact of noise, assess mitigation options and determine achievable noise requirements.

An extract from the NSW *NPfI* that relates to the amenity noise levels for surrounding receivers is given in Table 5-2.

Table 5-2 Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day[1]	Recommended Amenity Noise Level $L_{Aeq,period}$ (dBA)	Recommended Amenity Noise Level[2] $L_{Aeq,15min}$ (dBA)
Residence	Suburban	Day	55	53
		Evening	45	43
		Night	40	38

Note 1: Daytime 7.00am–6.00pm; Evening 6.00pm–10.00pm; Night 10.00pm-7.00am.
Note 2: Project amenity noise level (ANL) is suburban ANL less 5 plus 3dBA to convert from a period level to a 15-minute level.

5.1.3 Project Noise Trigger Levels

The noise emission trigger levels for industrial noise generated by the facility are provided in Table 5-3. The Project Noise Trigger Level is the lowest value of the intrusiveness or amenity noise level for each period.

Table 5-3 Project Noise Trigger Levels

Receivers	Period	Project Noise Trigger Levels $L_{Aeq(15min)}$ (dBA)	
		Intrusiveness	Amenity
Residential to the west – Stuart Road	Shoulder 6-7am	**55**	-
	Day	**49**	53
	Evening	48	**43**
	Night	44	**38**
Residential to the north – West Hoxton	Shoulder 6-7am	**49**	-
	Day	**44**	53
	Evening	**41**	43
	Night	**36**	38

5.2 Maximum Noise Level Events

Noise sources of short duration and high level that may cause disturbance to sleep if occurring during the night time need to be considered. For this project, there may be some operation during the morning shoulder beginning 6am.

The approach recommended by the *NPfI* is to apply the following initial screening noise levels:

- $L_{Aeq,15min}$ 40dBA or the prevailing RBL + 5dB, whichever is the greater; and/or
- L_{AFmax} 52dBA or the prevailing RBL + 15dB, whichever is the greater.

The sleep disturbance screening noise levels apply outside bedroom windows during the night time period.

Where the screening noise levels cannot be met, a detailed maximum noise level event assessment should be undertaken. It may also be appropriate to consider other guidelines including the NSW *Road Noise Policy (RNP)* which contains additional guidance relating to potential sleep disturbance impacts.

A review of research on sleep disturbance in the *RNP* indicates that in some circumstances, higher noise levels may occur without significant sleep disturbance. Based on currently available research results, the *RNP* concludes that:

- "Maximum internal noise levels below 50dBA to 55dBA are unlikely to cause awakening reactions."
- "One or two noise events per night, with maximum internal noise levels of 65dBA to 70dBA, are not likely to affect health and wellbeing significantly."

For maximum noise level events (night time period only) the following screening noise levels apply.

Table 5-4 Sleep Disturbance Trigger Levels – Morning Shoulder

Receiver	$L_{Aeq,15min}$	L_{AFmax}
1 – Stuart Road	55	65
2 – West Hoxton	49	59

6 OPERATIONAL NOISE ASSESSMENT

6.1 Noise Modelling

Site related noise emissions were modelled using the Cadna-A noise prediction software utilising the CONCAWE algorithm. To complete this, a representative 3-D model within the software was constructed of the site and surrounding residences.

Factors that are addressed in the modelling are:

- Equipment sound level emissions and locations;
- Screening effects from buildings;
- Receiver locations;
- Ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and
- Atmospheric absorption.

6.2 Noise Sources

Wilkinson Murray has conducted noise measurements at the existing Bunnings facilities in the past. Typical noise levels of operations and equipment have been established for assessment purposes.

Table 6-1 details these continuous L_{Aeq} noise levels. These noise levels represent overall noise emanating from all and sources in these areas.

Table 6-1 L_{Aeq} Noise Levels Of Loading Dock Operation events – dBA

Noise Source	Sound Pressure Level at 3m	Sound Power Level
Truck loading / unloading with Forklift (representing loading dock noise breakout)	77	95
Forklift working	71	89
Cleaning machine	64	82
Truck moving on site	86	104

In addition, the $L_{Aeq,15min}$ noise level associated with trade vehicles movement has been measured as 45dBA at 7m. This level has been used and multiplied by the number of vehicles in the period by adding 10xlog(n) where n is the number of vehicles, which in this case is 50.

Maximum noise levels associated with vehicle movements are shown in Table 6-2.

Table 6-2 L_{Amax} Noise Levels of Vehicle Movements – dBA

Event	L_{Amax} Sound Power Level	Sound Pressure Level at 7m
Truck Air Brake	110	85
Door Closing	94	69
Car Starting	90	65
Car Accelerating	97	72

The above noise levels have been used in our assessment.

6.3 Predicted Noise Levels at Residences

Continuous cumulative operational noise levels have been predicted at the nearest receivers surrounding the site using CadnaA noise modelling implementing the ISO 9613 prediction algorithm. The noise modelling for a typical "worst case" scenario has assumed to be:

- 50 vehicles on the site;
- Forklift, brick loading and cleaning machine working in the garden bulky goods area;
- One truck entering and leaving the loading area;
- A truck unloading;
- A forklift operating in the loading dock area; and
- Forklifts working in the in the loading area.

This represents the cumulative noise emission from the entire store between the proposed extended operating hours.

Table 6-3 presents predicted noise levels at surrounding residences with all equipment, carpark and loading dock areas operating.

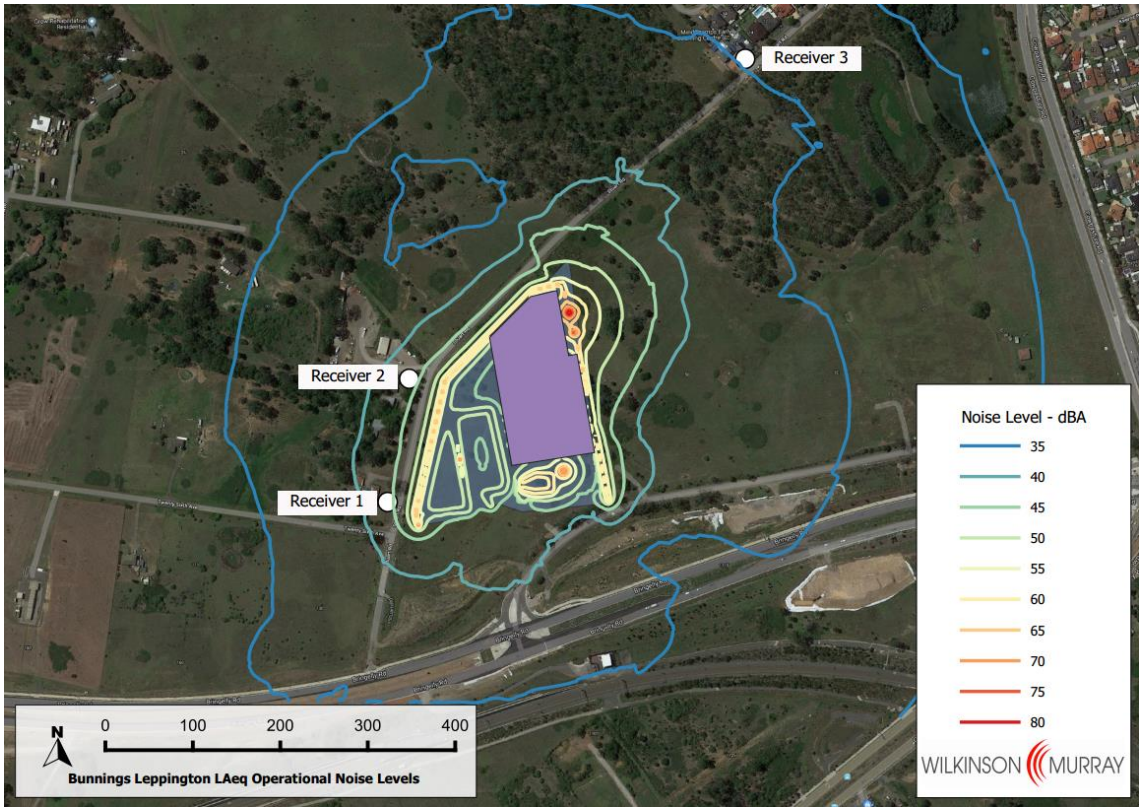
Table 6-3 Predicted Noise to Residential Premises – $L_{Aeq,15min}$ dBA

Location	Predicted Operational Noise Level	Noise Criterion (Shoulder / Day / Evening)	Compliance
Location 1 – Stuart Road	44	55 / 49 / 43	Marginal
Location 2 – Stuart Road	44	55 / 49 / 43	Marginal
Location 3 – West Hoxton	35	49 / 44 / 41	Yes

A review of the results indicates marginal compliance with site-specific noise criteria at the nearest residences on Stuart Road in the evening period. This level of predicted variance (1dBA) is within prediction tolerances and acoustically insignificant. It is worth noting that operation is only proposed for the Morning Shoulder period beginning at 6.00am. In the case of residences to the north, compliance is indicated for all periods of the proposed operation.

Figure 6-1 presents the results of noise modelling.

Figure 6-1 Predicted Noise Levels at Residences – dBA



6.4 Maximum Noise Levels

In the case of sleep disturbance, maximum noise levels are associated with car or truck movements in the car park and dock area.

Table 6-4 presents the predicted maximum noise levels at surrounding residences.

Table 6-4 Predicted Maximum Noise Levels at Residences – L_{Amax} dBA

Receiver Location	Noise Level	Screening Criteria
Location 1 – Stuart Road	47	65
Location 2 – Stuart Road	50	65
Location 3 – West Hoxton	45	59

Noise is predicted to comply with the screening criteria at all locations proposed night period operations at all location.

6.5 Cumulative Noise Level

The site is located to the western end of Bringelly Hub Business Area whereby noise to residences to the west of the site will be associated with the Bunnings Facility as the development will acoustically shield any development to the east of the Bunnings Site.

In the case of residences to the north at West Hoxton, resultant noise levels from Bunnings are predicted to be 9dBA and 6dBA below applicable day and evening noise criteria respectively. As such, the contribution to overall noise levels at these residences will be small as any industrial noise at these receivers is likely to be dominated by noise from closer industrial developments in the Business Hub.

7 AIR QUALITY

The outdoor storage is to comprise of orderly displays of pot plants, wheelbarrows and occasional seasonal products. There are no uncontrolled bulk bins of landscape/raw materials products as these are not stocked by Bunnings. All landscape products and raw materials are bagged off site and delivered to the store. Accordingly, dust generation by the proposed development will be minimal and of no significance to patrons and surrounding receivers.

In the case of construction works it is noted that much of the bulk earthworks have been completed by the developer of the Bringelly Business Hub. As such, much of the dust that will be generated by site development will occur prior to the works conducted by Bunnings. However, the following best practice methods of mitigation are recommended to be included in the site Construction Management Plan.

Good practice measures that can be adopted on site during construction where deemed practical by the contractors include:

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk. The desirable measures should be included as appropriate for the site.
- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the logbook.
- Undertake on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked.
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site.
- Ensure all vehicles switch off engines when stationary – no idling vehicles.

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction; e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Avoid bonfires and burning of waste materials.
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine power materials, ensure bags are sealed after use and stored appropriately to prevent dust.
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Access gates to be located at least 10 m from receptors where possible.

Where they are deemed reasonable and feasible, the aforementioned controls should be considered when developing the CDMP and included in the plan.

8 CONCLUSION

A noise and air quality assessment was completed for the proposed Bunnings Warehouse at Leppington. The assessment has included the assessment of all potential noise being that from the yard including, delivery vehicles and loading dock activities (including forklifts).

Background noise monitoring was used to establish the existing noise levels from which project specific noise criteria were derived. These criteria were developed using the EPA's *Interim Construction Noise Policy* and *Noise Policy for Industry*.

Construction noise and vibration has been assessed and determined that management of noise and dust will be required during this stage of the development. Measures for control have been presented for including, where feasible, in the successful contractors Environmental Management Plan.

The assessment has included the assessment of all potential noise being that from the yard including, delivery vehicles and loading dock activities (including forklifts). Compliance with established criteria has been established.

In the case of dust, no significant sources are proposed with the operation of the warehouse and, as such, are not relevant to the development. Measures for control of dust and particulates during construction have been provided.

APPENDIX A

NOISE MEASUREMENT RESULTS