RAPT CONSULTING

Construction Noise and Vibration Assessment – 11-17 Mosbri Crescent, The Hill

Prepared for

Crescent Newcastle Pty Ltd

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Prepared For:

Crescent Newcastle Pty Ltd

Prepared By:

RAPT Consulting

18&19 / 10 Kenrick Street

The Junction, NSW 2291

ABN: 30330220290

www.raptconsulting.com.au

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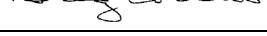
2221308_210407	0	Gregory Collins	
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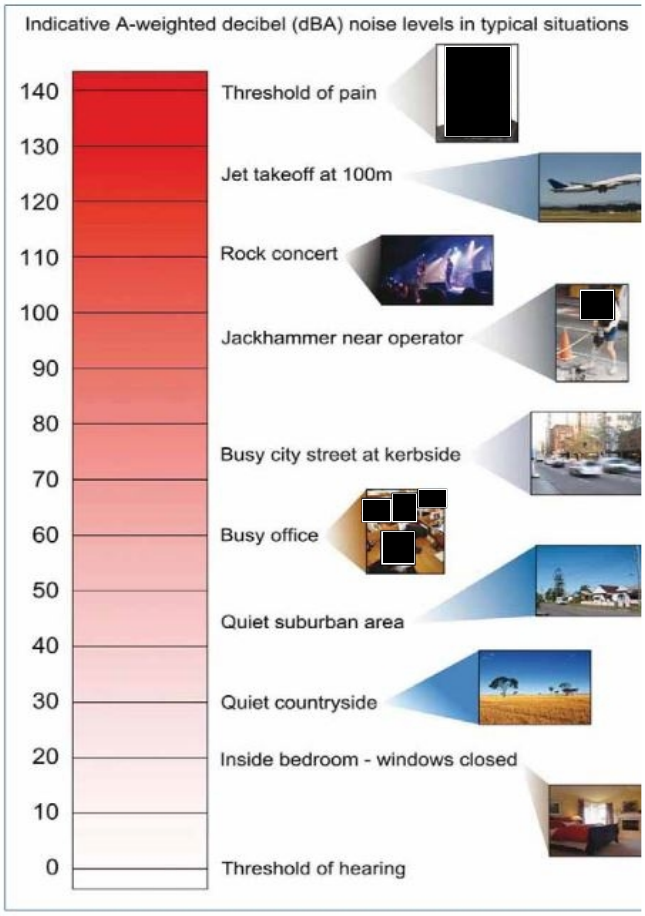
Glossary of Acoustic Terms

Term	Definition
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics. The picture below indicates typical noise levels from common noise sources. 
dB(A)	Frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at very low and very high frequencies.
$L_{Aeq(period)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{A10(period)}$	The sound pressure level that is exceeded for 10% of the measurement period.
$L_{A90(period)}$	The sound pressure level that is exceeded for 90% of the measurement period.
L_{Amax}	The maximum sound level recorded during the measurement period.

Noise sensitive receiver	◗ An area or place potentially affected by noise which includes: ◗ A residential dwelling. ◗ An educational institution, library, childcare centre or kindergarten. ◗ A hospital, surgery or other medical institution. ◗ An active (e.g. sports field, golf course) or passive (e.g. national park) recreational area. ◗ Commercial or industrial premises. ◗ A place of worship.
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
Feasible and Reasonable (Noise Policy for Industry Definition)	**Feasible** mitigation measure is a noise mitigation measure that can be engineered and is practical to build and/or implement, given project constraints such as safety, maintenance and reliability requirements. Selecting **Reasonable** measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure. To make a judgement, consider the following: ◗ Noise impacts ◗ Noise mitigation benefits ◗ Cost effectiveness of noise mitigation ◗ Community views.
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).

1. Introduction

1.1 Background

RAPT Consulting has been engaged to undertake a construction noise and vibration impact assessment (CNVIA) for Stronach as part of their project at 11-17 Mosbri Crescent, The Hill NSW. The purpose of the CNVIA is to assess potential noise and vibration impacts associated with mine grouting, demolition (early works) and construction.

The project site and surrounding area is provided in Figure 1.1.

Figure 1-1Project Site and Surrounding Area

1.2 Assessment Objectives

This CNVIA assesses the potential impacts from the early works and construction of the 11 – 17 Mosbri Crescent Project. The purpose of this CNVIA is to assess potential noise and vibration from its construction and to recommend mitigation measures where required.

The outcomes of this assessment include recommendations for potential noise and vibration mitigation and management measures designed to achieve an acceptable noise amenity for residential (dwelling) occupants and other potentially sensitive receivers surrounding the study area.

1.3 Scope

The CNVIA scope of work included:

- Initial desk top review to identify key environmental noise catchment areas and noise sensitive receptors from aerial photography
- Undertake attended noise measurements to establish background and ambient noise levels in the vicinity of potentially sensitive receivers
- Establish project noise and vibration goals for the construction of the project
- Identify the likely principal noise sources during construction and their potential impacts on noise receptors
- assessment of potential noise, vibration impacts associated with construction, of the project
- provide recommendations for feasible and reasonable noise and vibration mitigation and management measures, where noise or vibration objectives may be exceeded.

1.4 Relevant Guidelines

The relevant policies and guidelines for noise and vibration assessments in NSW that have been considered during the preparation of this NVIA include:

- Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change, 2009
- Assessing Vibration: A Technical Guideline, Department of Environment and Conservation (DEC), 2006
- British Standard BS7385.2 - 1993 *Evaluation and Measurement for Vibration in Buildings*, Part 2 - Guide to damage levels from ground borne vibration 1993
- DIN 4150: Part 3-1999 Structural vibration – Effects of vibration on structures 1999
- NSW Road Noise Policy (RNP), Department of Environment, Climate Change and Water (DECCW), 2011
- Noise Policy for Industry (NPfI), Environment Protection Authority (EPA), 2017.

1.5 Limitations

The purpose of this report is to provide an independent noise and vibration assessment for the project.

It is not the intention of the assessment to cover every element of the acoustic environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the noise assessment represent the findings apparent at the date and time of the assessment undertaken. It is the nature of environmental assessments that all variations in environmental conditions cannot be assessed and all uncertainty concerning the conditions of the ambient environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

In conducting this assessment and preparing the report, current guidelines for noise were referred to. This work has been conducted in good faith with RAPT Consulting's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

2. Existing Environment

To establish background and ambient noise levels, attended measurements were conducted to the west of the site in the vicinity of potentially nearest affected residences. The location selected was considered indicative of the local ambient noise environment.

Measurements were conducted using a RION NL-42 Sound Level Meter with Type 2 Precision. 15-minute measurements were undertaken for the Daytime time Periods as it is understood the construction will be undertaken during standard construction hours. The attended noise surveys were conducted with consideration to the procedures described in Australian Standard AS 1055:2018, “Acoustics – Description and Measurement of Environmental Noise” and the NSW Noise Policy for Industry (NPfI). Calibration was checked before and after each measurement and no significant drift occurred. The acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-Electroacoustics – Sound level meters – Specifications.

During site visits it was noted that existing road traffic, distant road traffic, and natural wildlife primarily described the ambient noise environment and is indicative of an urban noise environment. The attended measurements were undertaken during calm conditions.

Figure 2-1 shows the attended monitoring location.

Figure 2-1 Monitoring Location Mosbri Crescent

The LA90 descriptor is used to measure the background noise level. This descriptor represents the noise level that is exceeded for 90 per cent of the time over a relevant period of measurement. The LA90 descriptor is used to establish the Rating Background Noise Level (RBL). The RBL has been calculated, according to the procedures described in the EPA’s NPfI and by following the procedures and guidelines detailed in Australian Standard AS1055-1997, "Acoustics - Description and Measurement of Environmental Noise, Part 1 General Procedures." The LAeq is the equivalent continuous noise level which would have the same total acoustic energy over the measurement period as the varying noise actually measured, so it is in effect an energy average.

Logged data was reviewed and filtered to exclude any extraneous data results during the monitoring period. The RBL (LA90) and ambient levels (LAeq) are provided in Table 2-1.

Table 2-1 Noise Monitoring Results

Location	Noise Period	Noise Level dB(A)		Noise Sources
		L_{Aeq}	L_{A90}	
Mosbri Crescent	01/04/2021 11:45pm – 12:00pm	53	41	road traffic, wildlife noise

3. Noise and Vibration Objectives

3.1 Construction Noise

Construction noise is assessed with consideration to DECCW *Interim Construction Noise Guidelines* (ICNG) (July 2009). The INCG is a non-mandatory guideline that is usually referred to by local councils and other NSW government entities when construction / demolition works require development approval. The ICNG recommend standard hours for construction activity as detailed in Table 3-1.

Table 3-1 ICNG Recommended Construction Hours

Work type	Recommended standard hours of work
Normal construction	Monday to Friday: 7 am to 6 pm. Saturday: 8 am to 1 pm. No work on Sundays or Public Holidays.
Blasting	Monday to Friday: 9 am to 5 pm. Saturday: 9 am to 1 pm. No work on Sundays or Public Holidays.

The ICNG provides noise management levels for construction noise at residential and other potentially sensitive receivers. These management levels are to be calculated based on the adopted rating background level (RBL) at nearby locations, as shown in Table 3-2.

Table 3-2 ICNG Noise Guidelines at Receivers

Period	Management Level $L_{Aeq(15\ min)}$
Residential Recommended standard hours	Noise affected level: RBL + 10 Highly noise affected level: 75 dB(A)
Residential Outside recommended standard hours	Noise affected level: RBL + 5
Classrooms at schools and other educational institutions	Internal Noise Level 45 dB(A) (applies when properties are being used)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	65 dB(A)
Offices, retail outlets (external)	70 dB(A)
industrial premises (external)	75 dB(A)

The above levels apply at the boundary of the most affected residences / offices or within 30 m from the residence where the property boundary is more than 30 m from the residence.

The *noise affected level* represents the point above which there may be some community reaction to noise. Where the *noise affected level* is exceeded all feasible and reasonable work practices to minimise noise should be applied and all potentially impacted residents should be informed of the nature of the works, expected noise levels, duration of works and a method of contact. The *noise affected level* is the background noise level plus 10 dB(A) during recommended standard hours and the background noise level plus 5 dB(A) outside of recommended standard hours.

The *highly noise affected level* represents the point above which there may be strong community reaction to noise and is set at 75 dB(A). Where noise is above this level, the relevant authority may require respite periods by restricting the hours when the subject noisy activities can occur, considering:

- Times identified by the community when they are less sensitive to noise (such as mid-morning or mid-afternoon for works near residences).
- If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

It is understood construction is planned for standard hours. Based on the above and the RBL's determined from site monitoring, construction noise management levels (NML's) have been derived, as shown in Table 3-3.

Table 3-3 ICNG NML's Leq(15min) dB(A)

Receiver	Within Recommended Standard Hours
Residential	51

3.2 Road Noise

The NSW Road Noise Policy (RNP) recommends various criteria for different road developments and uses. Based on the definitions in the RNP, Mosbri Crescent and associated roads are considered local roads. Table 3 of the RNP provides guidance for establishing road traffic noise assessment criteria for residential land uses.

Road noise goals based on Table 3 of the NSW Road Noise Policy are provided in Table 3-4 below.

Table 3-4 Road Noise Goals

Situation	Day 7 am to 10 pm	Night 10 pm to 7 am
Land use development with potential to create additional traffic on Local Roads (external)	55 $L_{Aeq(1\ hour)}$	50 $L_{Aeq\ (1\ hour)}$

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by construction activities and or land use developments, any increase in the

total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

Information regarding truck movements for the site are shown in Table 3-5.

Table 3-5 Truck Movements On-Site

Vehicles / Trucks	Truck Movements	
	Day	Week
Cement Trucks	1	6
Truck and Dogs	10	60
Removal of Spoil	(not required every day)	1-2

Site construction traffic will have blended in with local traffic by the time it goes past the nearest sensitive receivers. To increase noise levels by 2dB(A) one would have to increase the cumulative traffic volume by 60%. The amount of additional construction traffic on the road network is negligible and will not increase overall traffic noise levels on the surrounding road network. Therefore, compliance is expected and not considered further in this report.

3.3 Vibration Guidelines

3.3.1 Human Exposure

Vibration goals the were sourced from the DECCW's *Assessing Vibration: a technical guideline*, which is based on guidelines contained in British Standard (BS) 6472–1992, *Evaluation of human exposure to vibration in buildings (1–80 Hz).*

Vibration, at levels high enough, has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities
- impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities
- intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

The preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced in Table 3-6 for the applicable receivers.

Table 3-6 Preferred and Maximum Levels for Human Comfort

Location	Assessment Period[1]	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Impulsive vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14

Note 1 Daytime is 7:00am to 10:00pm and Night-time is 10:00pm to 7:00am

The acceptable vibration dose values (VDV) for intermittent vibration are defined in Table 2.4 of the guideline and are reproduced in Table 3-7 for the applicable receiver type.

Table 3-7 Acceptable Vibration Dose Values for Intermittent Vibration (m/s1.75)

Location	Daytime [2]		Night-time [2]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas [3]	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

Note 2 Daytime is 7:00 to 22:00 and night-time is 22:00 to 7:00: and
Note 3 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be needed to assess intermittent values against the continuous or impulsive criteria for critical areas.

3.3.2 Building Damage

Currently, there is no Australian Standard that sets the criteria for the assessment of building damage caused by vibration. Guidance of limiting vibration values is attained from reference to the following International Standards and Guidelines:

- British Standard BS7385.2 - 1993 *Evaluation and Measurement for Vibration in Buildings*, Part 2 - Guide to damage levels from ground borne vibration
- German Standard DIN 4150-3: 1999-02 Structural Vibration – Part 3: *Effects of vibration on structures*.

The recommended Peak Particle Velocity (PPV) guidelines for the possibility of vibration induced building damage are derived from the minimum vibration levels above which any

damage may occur are presented in Table 3-8 for DIN 4150-3: 1999-02 and Table 3-9 for BS7385.2 – 1993.

Table 3-8 DIN 4150-3 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on structures

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz*	
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20-40	40-50	40
Dwellings and buildings of similar design and/or occupancy	5	5-15	15-20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 of table 5-7 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note 4 At frequencies above 100Hz, the values given in this column may be used as minimum values

Table 3-9 BS7385.2 Transient Vibration Guideline Values for Potential building - Cosmetic Damage

Building Type[6]	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz[5]	15 Hz and above[5]
Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures. Residential or light commercial type buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 5 Values referred to are at the base of the building: and
Note 6 For transient vibration effecting unreinforced or light framed structures at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

Unlike noise which travels through air, the transmission of vibration is highly dependent on substratum conditions between the source/s and receiver. Also dissimilar to noise travelling through air, vibration levels diminish quickly over distance, thus an adverse impact from

vibration on the broader community is not typically expected. Vibration during 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.

4. Assessment of Potential Impacts

4.1 Construction Noise

Construction can occur in the vicinity of residences or other sensitive land uses and be variable in times of occurrence. These aspects of construction can exacerbate noise levels and their effects. Construction noise by its nature is temporary, may not be amenable to purpose-built noise control measures applied to industrial processes, and may move as construction progresses. With these constraints in mind, The ICNG was developed to focus on applying a range of work practices most suited to minimise construction noise impacts, rather than focusing only on achieving numeric noise levels. While some noise from construction sites is inevitable, the aim of the Guideline is to protect much of residences and other sensitive land uses from noise pollution most of the time.

Mine Grouting Scope

Information provided regarding the mine grouting programme is as follows:

1. drilling 111x115mm holes to a depth of 40 to 90m below surface. This will result in approximately 12m2 of site area being drilled, which over the 12,235m2 site is less than 1% of site area.

2. cement batching on site using fly ash and cement. The Mines Contractor will verify that all ash material used meets all the requirements of the NSW EPA Coal Ash Order, as the consumer of the material, in accordance section 7. (Resource Recovery Exemption under Part 9, clauses 91 and 92 of the PoEO Waste Regulation – The Coal Ash Exemption 2014) it can be mixed in both cementitious mixes and non-cementitious mixes and used as fill material.

3. Grout Summary:

Table 4-1 Grout Summary

Seam	Yard Seam	Borehole Seam
Depth of Seam	41-45m	90-100m
Number of Boreholes	71	52
Estimated Quantity per Borehole	30m3	400m3
Estimated Total Volume	2,000m3	20,800m3
Total Estimated Grout Volume	22,800m3	

4. Working Hours: Working hours on site will be from Monday to Friday 7am to 5pm and Saturday 7am to 1.30pm.

5. Total Estimated Duration: between 3 – 5 months. This is an estimate, and this duration may change depending on weather, site conditions, drilling progress, volumes of grout required to fill the voids.

6. Parking – Trucks will enter the site and park during the mines and demolition works.

    - Cement Trucks will take approximately an hour to unload.
    - The trucks delivering Ash will unload material and leave site within a 10 – 30-minute turnaround.

Noise Generating Equipment

It is understood any construction activities would be undertaken during standard hours. Likely equipment including typical sound levels are summarised in Table 4-2. Noise level data has been obtained from AS2436, the RMS Construction Noise Estimator and RAPT Consulting internal database. Other equipment may be used however it is anticipated that they would produce similar noise emissions.

Table 4-2 Typical Construction Item Sound Power Levels

Plant and Equipment	Estimated % of use in 15 minutes[1]	Typical Sound Power Level dB(A)
Truck and Dog	50	110
Front End Loader	50	112
Drill Rig	50	112
Cement Truck	50	109
Mobile Batching Plant	50	114

Note 7 The sound power levels for the individual plant items are worst-case levels representative of the equipment operating at maximum capacity. In practice, not all plant items would operate at maximum capacity at the same time and therefore the estimated usage has been adjusted to reflect this. This adjustment is consistent with RAPT Consulting experience on similar projects.

Construction Operations

Acoustic modelling was undertaken using Bruel and Kjaer's "Predictor" to predict the effects of construction noise. Predictor is a computer program for the calculation, assessment and prognosis of noise propagation. Predictor calculates environmental noise propagation according to ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors". Terrain topography, ground absorption, atmospheric absorption and relevant shielding objects are taken into account in the calculations.

Construction noise levels have been predicted based on the potential construction noise levels provided in Table 4-2. These noise levels represent different equipment noise levels and give an idea how noise levels may change across the proposal area with different activities being undertaken.

The magnitude of off-site noise impact associated with construction would be dependent upon several factors:

- The intensity of construction activities
- The location of construction activities;
- The type of equipment used;
- Intervening terrain; and
- The prevailing weather conditions.

In addition, construction machinery would likely move about the study area, variously altering the directivity of the noise source with respect to individual receivers and their distances. Noise levels at sensitive receivers can be significantly lower than the worst-case scenario when the construction works move to a more distant location in the work area. An example of this is shown in Figure 4.1.

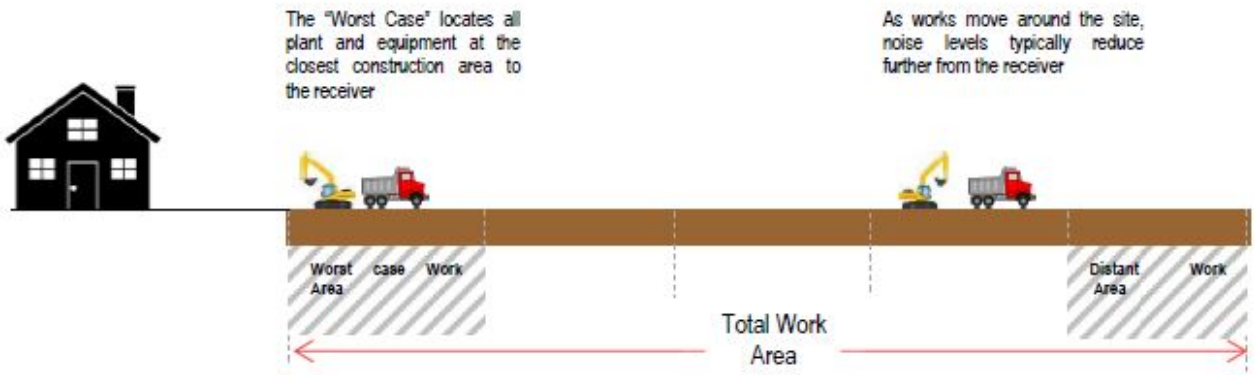


Figure 4-1 Example of Differing Work Areas

During any given period, the machinery items to be used in the study area would operate at maximum sound power levels for only brief stages. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time. Finally, certain types of construction machinery would be present in the study area for only brief periods during construction. Therefore, the modelled construction noise results are considered to represent a worst-case scenario. These scenarios also demonstrate how received noise levels can change due to location of construction activity.

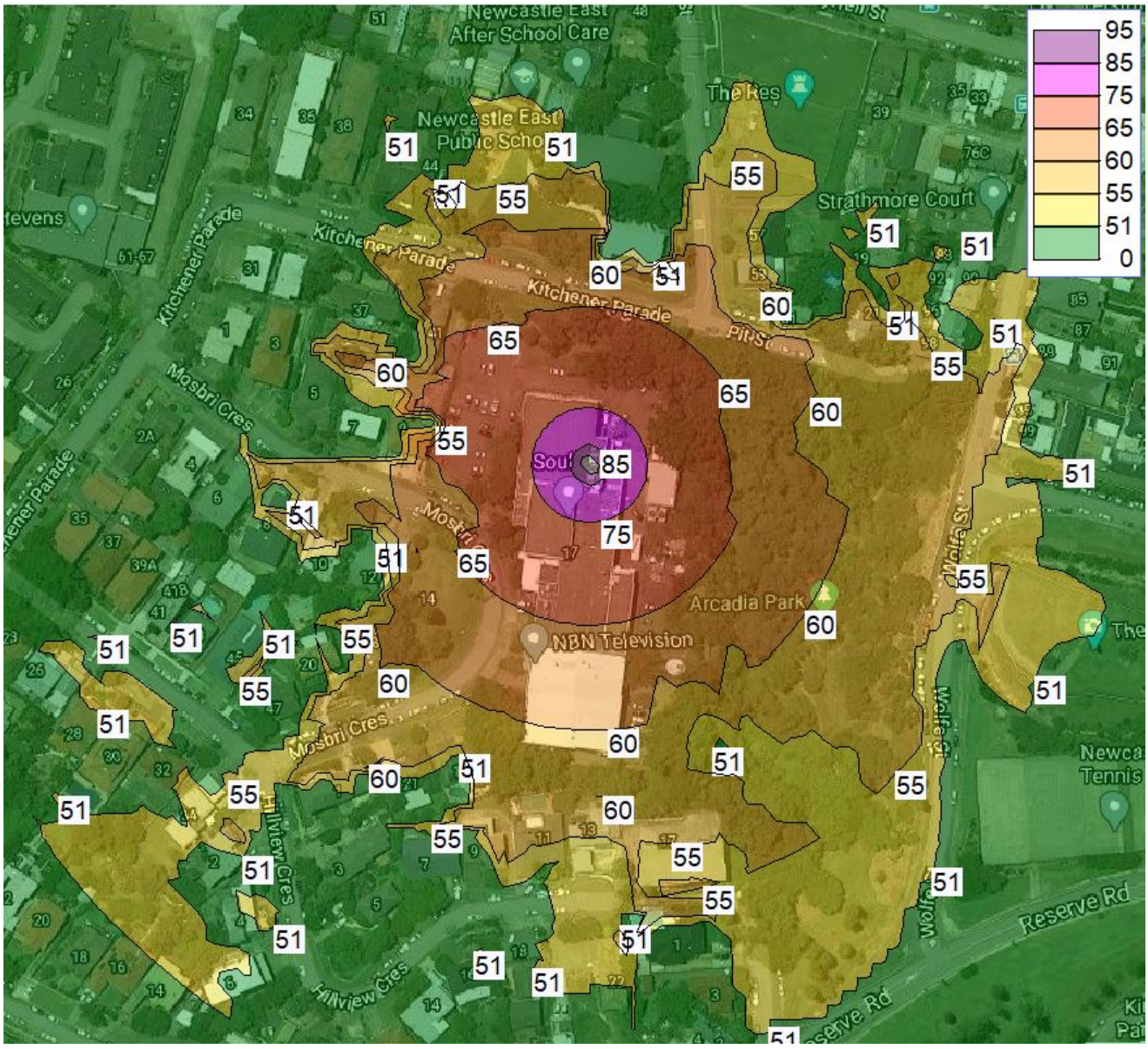


Figure 4-2 North Scenario dB(A) Leq(15min)

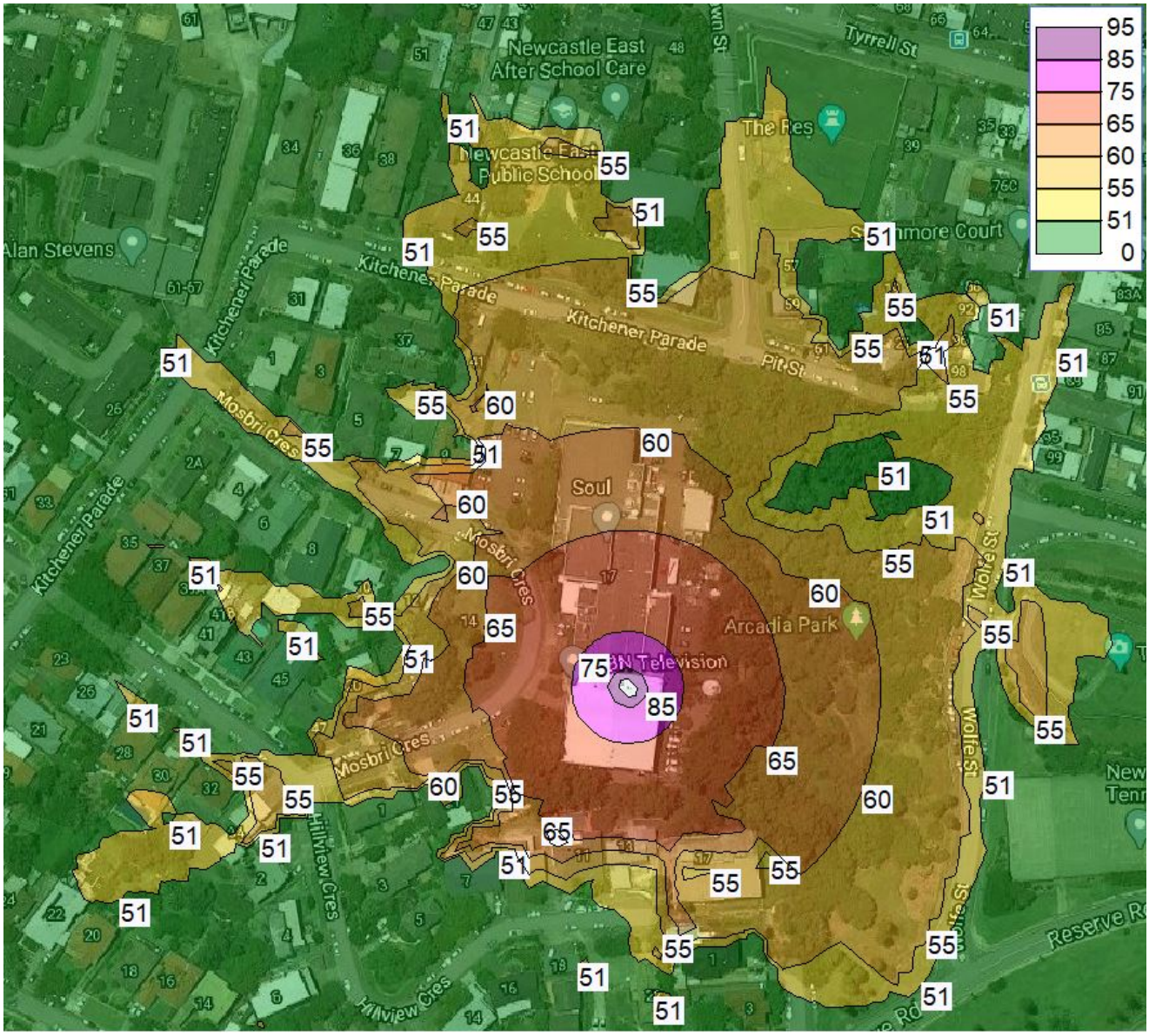


Figure 4-3 South Scenario dB(A) Leq(15min)

The results of the construction assessment indicate NML's can be met in most situations however, there is the potential to be exceeded particularly for when construction activities are taking place in close proximity to residences. However, the highly affected noise level is expected to be complied with in all situations. Additionally, NML's for offices and retail outlets and other industries is expected to be complied with. The NSW Environmental Noise Management Manual specifies that standard window glazing of a building will typically attenuate the external noise levels by at least 20dB(A) with the windows closed and 10 dB(A) with the windows open (allowing for natural ventilation). With this in mind the NML's are also expected to be met for the Newcastle East Public School. While NML's can be achieved in most cases for residential, office and retail outlets, and schools, there is a risk for NML's to be exceeded depending on work activities and locations. With this in mind it is recommended a construction noise and vibration management plan be implemented as part of the construction programme to minimise the risk of adverse noise emanating upon the community.

4.2 Construction Vibration

The relationship between vibration and the probability of causing human annoyance or damage to structures is complex. This complexity is mostly due to the magnitude of the vibration source, the particular ground conditions between the source and receiver, the foundation-to-footing interaction and the large range of structures that exist in terms of design (e.g. dimensions, materials, type and quality of construction and footing conditions). The intensity, duration, frequency content and number of occurrences of vibration, are all important aspects in both the annoyances caused and the strains induced in structures.

Energy from construction equipment is transmitted into the ground and transformed into vibrations, which attenuates with distance. The magnitude and attenuation of ground vibration is dependent on the following:

- The efficiency of the energy transfer mechanism of the equipment (i.e. impulsive, reciprocating, rolling or rotating equipment).
- The Frequency content.
- The impact medium stiffness.
- The type of wave (surface or body).
- The ground type and topography.

Due to the above factors, there is inherent variability in ground vibration predictions without site-specific measurement data.

Ground Vibration – Minimum Working Distances from Sensitive Receivers

The Transport for NSW Construction Noise and Vibration Strategy (CNVS) provides guidance for minimum working distances. As a guide, minimum working distances from sensitive receivers for typical items of vibration intensive plant are listed in Table 4-3. The minimum distances are quoted for both “cosmetic” damage (refer BS 7385) and human comfort (refer DECC’s Assessing Vibration - a technical guideline). DIN 4150 has criteria of particular reference for heritage structures. The minimum working distances are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions.

Table 4-3 Recommended Minimum Safe Working Distances for Vibration Intensive Plant from Sensitive Receiver

Plant Item	Rating / Description	Minimum Distance Cosmetic Damage		Minimum Distance Human Response (NSW EPA Guideline)
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Vibratory Roller	<50 kN (1-2 tonne)	5m	11m	15m to 20m
	<100 kN (2-4 tonne)	6m	13m	20m
	<200 kN (4-6 tonne)	12m	15m	40m
	<300kN (7-13 tonne)	15m	31m	100m
	>300kN (13-18 tonne)	20m	40m	100m
	>300kN (>18 tonne)	25m	50m	100m
Small Hydraulic Hammer	300kg (5 to 12 t excavator)	2m	5m	7m
Medium Hydraulic Hammer	900kg (12 to 18 t excavator)	7m	15m	23m
Large Hydraulic Hammer	1600kg (18 to 34 t excavator)	22m	44m	73m
Vibratory Pile Driver	Sheet Piles	2m to 20m	5m to 40m	20m
Pile Boring	≤ 800mm	2m (nominal)	5m	4m
Jack Hammer	Hand Held	1m (nominal)	3m	2m

Given the proximity of nearest residential receptors from the proposal, while not expected, if hydraulic hammering were to occur, it is recommended no larger than small 300kg (5 to 12t excavator) be utilised.

4.3 Construction Noise and Vibration Management Plan

A Construction Noise and Vibration Management Plan (CNVMP) could be prepared prior to the commencement of works and implemented through all phases of the proposed construction works. The CNVMP would provide the framework for the management of all

potential noise impacts resulting from the construction works and would detail the environmental mitigation measures to be implemented throughout the construction works.

4.3.1 Planning and design of construction works

During the detailed planning, scheduling and design of the construction works the following noise management and mitigation measures should be investigated and, as required, implemented prior to the commencement of noise generating works.

Notification before and during construction

- Affected neighbours to the construction works would be advised in advance of the proposed construction period at least 1 week prior to the commencement of works.
- Consultation and communication between the site and neighbours to the site would assist in minimising uncertainty, misconceptions and adverse reactions to noise.
- All site workers (including subcontractors and temporary workforce) should be familiar with the potential for noise impacts upon residents and encouraged to take all practical and reasonable measures to minimise noise during their activities.
- The constructor or site supervisor (as appropriate) should provide a community liaison phone number and permanent site contact so that the noise related complaints, if any, can be received and addressed in a timely manner.
- The constructor (as appropriate) should establish contact with the residents and communicate, particularly when noisy activities are planned.

Best practice measures when operating on construction site

- Construction works should adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG. BMP includes factors discussed within this report and encouragement of a project objective to reduce noise emissions. BATEA practices involve incorporating the most advanced and affordable technology to minimise noise emissions.
- Ensure that all construction works scheduled for standard construction hours comply with the start and finish time.
- Where practical, simultaneous operation of dominant noise generating plant should be managed to reduce noise impacts, such as operating at different times or increase the distance between plant and the nearest identified receiver.
- High noise generating activities such as jack hammering should only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block.
- Where possible, reversing beepers on mobile equipment would be replaced with low-pitch tonal beepers (quackers). Alternatives to reversing beepers include the use of spotters and designing the site to reduce the need for reversing may assist in minimising the use of reversing beepers.
- Equipment which is used intermittently should be shut down when not in use.

- All engine covers should be kept close while equipment is operating.
- The construction site would be arranged to minimise noise impacts by locating potentially noisy activities away from the nearest receivers wherever possible.
- To minimise heavy equipment handling noise, material stockpiles should be located as far as possible from the nearest receptors
- Loading and unloading areas should be located as far as possible from the nearest receptors.
- Where possible, trucks associated with the work area should not be left standing with their engine operating in a street adjacent to a residential area.
- All vehicular movements to and from the site should comply with the appropriate regulatory authority requirement for such activities.

Complaints handling

Noise and vibration monitoring could be undertaken upon receipt of a complaint to identify and quantify the issue and determine options to minimise impacts.

- If valid noise and/or vibration data for an activity is available for the complainant property, from works of a similar severity and location, it is not expected that monitoring will be repeated upon receipt of repeated complaints for these activities, except where vibration levels are believed to be potentially damaging to the building.
- Any noise and/or vibration monitoring should be undertaken by a qualified professional and with consideration to the relevant standards and guidelines. Attended noise and/or vibration monitoring should be undertaken upon receipt of a noise and/or vibration complaint. Monitoring should be undertaken and reported within a timely manner (say 3 to 5 working days). If exceedance is detected, the situation should be reviewed to identify means to reduce the impact to acceptable levels.

5. Conclusion

This CNVIA assessment has been undertaken by RAPT Consulting for Stronach as part of their proposal at 11-17 Mosbri Crescent, The Hill NSW. The purpose of the CNVIA is to assess potential noise and vibration impacts associated with mine grouting and demolition (early works) and construction.

Given the distance to nearest receptors, the assumptions made in the assessment and the nature of the construction works, it is expected that construction noise can comply with adopted NML's in most situations. However, there are circumstances where NML's have the potential to be exceeded. Therefore, a standard set of construction noise management measures has been provided to deal with the unlikely event of any noise issues. It is believed through the implementation of a CNVMP unlikely noise issues can be managed and mitigated to ensure construction noise is minimised to achieve NML's for the proposal.