Report

Acoustics

29-57 CHRISTIE STREET, ST LEONARDS

Arrow Capital Partners

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A TETRA TECH COMPANY

Table of Contents

1 INTRODUCTION

NDY have been engaged by Arrow Capital Partners to undertake a Noise Impact Assessment as part of the development approval for the proposed 29-57 Christie Street commercial development in St Leonards NSW 2065. Two noise loggers were placed at adjacent properties to determine existing ambient noise levels over the period of one week. The site, adjacent buildings, and logging locations are marked-up in Figure 1 below. For the purposes of this report, the logger closest to the project site will be identified as Logger 1 (L1), and the logger at 24 Nicholson Street as Logger 2 (L2).

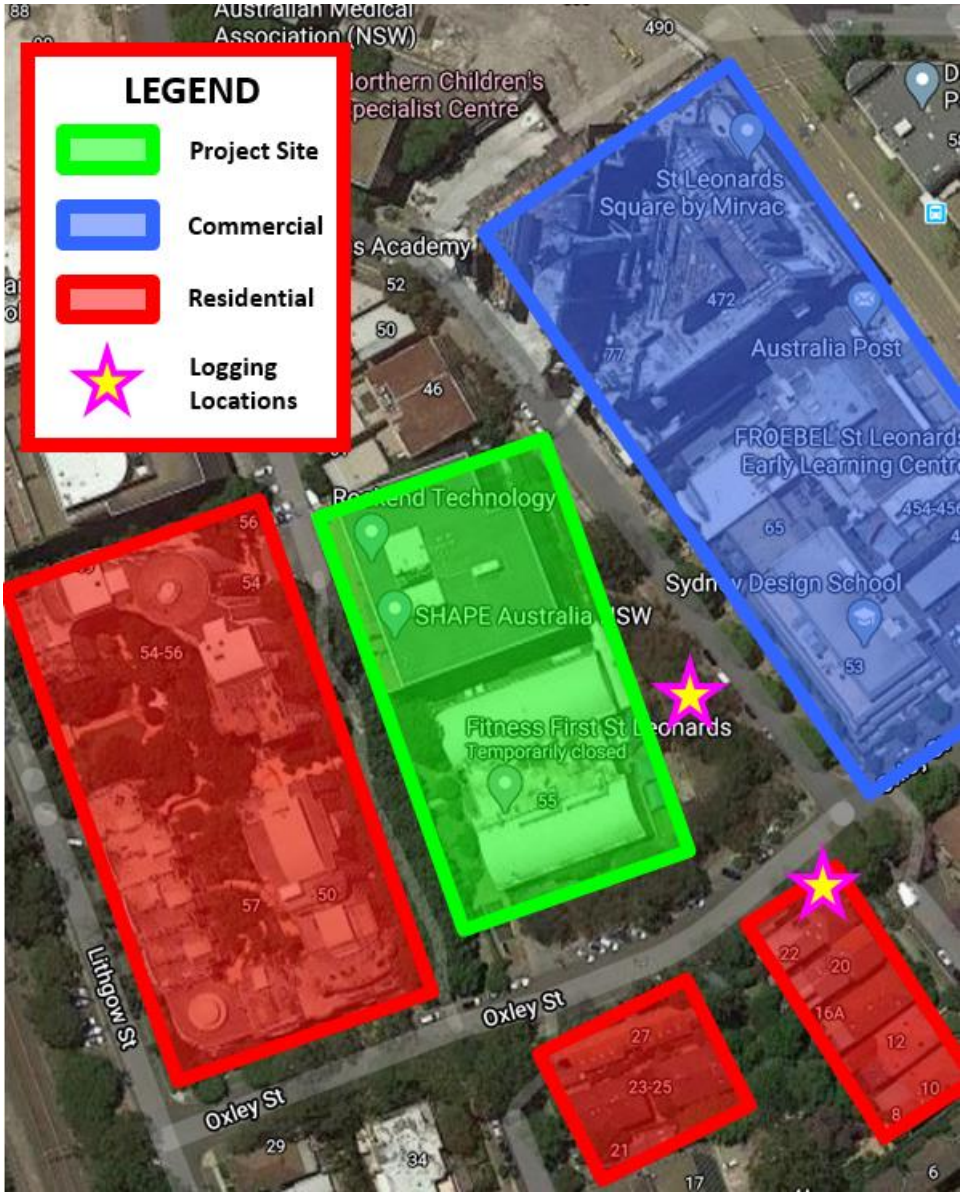

Figure 1: Project Site and surroundings

2 ACOUSTIC SURVEY

2.1 Methodology

Unattended noise measurements were conducted to determine the existing ambient noise levels for the area. These measurements were carried out over a period of 7 days, between 24th April and 1st May 2020 at the locations marked in Figure 1. Despite the current COVID-19 pandemic affecting traffic flow, NDY were advised to proceed with unattended measurements and conservatively assume traffic flow has halved to determine project trigger noise levels and the limiting criteria for the proposed development.

The monitoring locations were selected with one on a nearby residential property, identified as 24 Nicholson Street, and one on the property boundary of 57 Christie Street, St Leonards.

2.2 Instrumentation

Noise levels were measured using an Environmental Noise Logger ARL Type EL-316. The equipment calibration was checked prior to, and after the noise survey using a 94dB tone at 1 kHz. No significant drift was noted during the calibration procedure (i.e. less than 0.5dB).

The noise monitor was configured to record all relevant noise parameters including background noise (L_{A90}) and equivalent continuous noise levels (L_{Aeq}). Samples were recorded at 15-minute A-weighted continuous intervals. The noise monitor responses were set to *fast* response.

2.3 Weather Data

In order to verify that the noise data was obtained during suitable meteorological conditions, weather data such as rain and wind speed was obtained from the Bureau of Meteorology (BOM) weather station at Observatory Hill as a representative site.

Noise data has been excluded (as per the NSW NPfI methodology) from the results if:

- Rain was observed during the fifteen-minute noise measurement period and/or;
- Wind speed excluded 5m/s during the fifteen-minute noise measuring period.

2.4 Unattended Noise Measurements

For the assessment, the measured noise data was processed into the following time periods:

- Daytime: 0700 to 1800 hrs;
- Evening: 1800 to 2200 hrs;
- Night-time: 2200 to 0700 hrs.

The measured background (L_{A90}) and equivalent continuous (L_{Aeq}) noise levels during these defined time periods are presented in Table 1, at both location L1 and L2.

The L_{A90} noise levels presented are *Rating Background Levels* (RBLs), being the median of the background L_{A90} (i.e. of the lowest 10th percentile of samples) in each daytime, evening and night-time measurement period, or each 24-hour period during the noise survey.

The L_{Aeq} noise levels presented are the logarithmic average of all the L_{Aeq} samples taken in each of the daytime, evening and night-time periods.

The values in Table 1 have been adjusted up by 3 dB in line with the assumption that traffic flow has halved during COVID-19 conditions. As traffic is considered a line source, the doubling of traffic translates to a 3 dB increase in noise levels.

Table 1: Unattended measured L_{A90} and L_{Aeq} levels at noise logging location L1 and L2

Noise Index	Noise Levels, dB		
	Daytime 0700 to 1800	Evening 1800 to 2200	Night-time 2200 to 0700
Location 1 – Nicholson St (near Childcare Centre), St Leonards			
L_{A90} (RBL)	44	43	42
L_{Aeq}	54	52	46
Location 2 – 24 Nicholson Street, St Leonards			
L_{A90} (RBL)	46	44	42
L_{Aeq}	54	51	45

3 ACOUSTIC CRITERIA

This section will outline the acoustic criteria used to establish our project specific noise criteria or day, evening and night-time periods.

3.1 NSW Noise Policy for Industry 2017

Based on the unattended noise survey discussed in Section 2 of this report, the external noise level criteria for nearest residences have been derived in accordance with the NSW Noise Policy for Industry (NSW NPfI).

The NSW NPfI provides assessment methodologies, criteria and detailed information on the assessment of environmental noise emissions in NSW.

The NSW NPfI criteria for noise sources considers two (2) components:

- Controlling **intrusive** noise impacts for residential receivers. Assessing intrusiveness generally requires noise measurements to quantify background (L_{A90}) noise levels at a location considered representative of the most potentially affected residential receiver(s). The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) of the source(s) under consideration should be controlled to not exceed background noise levels by more than 5 dB.
- Maintaining noise **amenity** for various categories of land use (including residential receivers and other sensitive receivers). The amenity criterion is based on the sensitivity of a particular land use to industrial-type noise. The recommended amenity noise levels detailed in Table 2.2 of NSW NPfI represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location. This is to ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area. The project amenity criteria for each new source of industrial noise is equalled to the recommended amenity noise level minus 5 dB(A). An additional 3dB(A) is also to be added to the project amenity noise level for conversion from a period level to a 15-minute level. Where the resultant project amenity noise level is 10 dB or more below the existing industrial noise level, the project amenity noise levels can be set at 10 dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.

For receivers other than residences, the NSW NPfI recommends using the amenity criteria as detailed in the Application Notes of the policy. These criteria are listed in Table 2 below. The acceptable noise levels have been adjusted in accordance with the NSW NPfI. Results from logging at both locations are shown.

Table 2: NSW NPfI Project Intrusiveness and Amenity Noise Criteria for L1 and L2

Receiver	Noise Level, dB		
	Daytime 0700 to 1800	Evening 1800 to 2200	Night-time 2200 to 0700
Resdiential – L1	**Project Intrusiveness Assessment, $L_{Aeq,\ 15\ min}$**		
	49	48	47
	Project Amenity Assessment, $L_{Aeq,\ 15\ min}$		
	58	48	43

Receiver	Noise Level, dB		
	Daytime 0700 to 1800	Evening 1800 to 2200	Night-time 2200 to 0700
Residential – L2	**Project Intrusiveness Assessment, $L_{Aeq, 15\ min}$**		
	51	49	47
	Project Amenity Assessment, $L_{Aeq, 15\ min}$		
	58	48	43

3.1.1 Project Trigger Noise Levels

The project trigger noise levels are the most stringent noise levels of the NSW NPfI project intrusiveness and project amenity noise levels for day, evening and night-time periods and are project specific. Table 3 below presents the project trigger noise level (PTNL) for the closest receivers.

Table 3: External Project Trigger Noise Level (PTNL) for L1 and L2

Location	Time	External PTNL at L1, $L_{Aeq, 15\ min}$, dB	External PTNL at L2, $L_{Aeq, 15\ min}$, dB
Residential	Day	51	49
	Evening	48	48
	Night	43	43

3.1.2 Sleep Disturbance

In accordance with NSW NPfI 2017, the potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages. Data is considered from L2 only as this is considered the most representative location at which sleep disturbance will occur.

A detailed maximum noise level event assessment should be undertaken where the subject development/premises night-time noise levels at a residential location exceed the following:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or;
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,

Table 4: Sleep disturbance noise limits – L2 only.

Location	Given Noise Limits, dB	Limits based on RBL, dB	Sleep Disturbance Criteria
Residential	$L_{Aeq,15min}$ 40	$L_{Aeq,15min}$ 48 (43+5)	$L_{Aeq,15min}$ 48
	L_{AFmax} 52	L_{AFmax} 58 (43+15)	L_{AFmax} 58

3.2 Road Noise Policy

Section 2.3 of the NSW Road Noise Policy (NSW RNP) sets out the assessment criteria for residences to be applied to commercial land developments which may create additional traffic on existing roads. The surrounding roads to the proposed development include Christie Street, Nicholson Street and Oxley Street, which are all identified as local roads according to the NSW RNP.

Table 5: Road traffic noise assessment criteria for residential land uses from Section 2.3 of NSW RNP

Road Category	Type of project/land use	Assessment Criteria, $L_{Aeq\ 1\ hour}$, dB(A)	
		Day (7am-10pm)	Night (10pm-7am)
Local Roads	Existing residences affected by **additional traffic** on existing local roads generated by land use developments	55 (External)	50 (external)

Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria.

In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible by the average person.

At this stage based upon a small increase in the number of parking spaces, that the impacts to the road traffic network will be largely negligible.

4 OPERATIONAL NOISE IMPACT ASSESSMENT

4.1 Mechanical Plant

It is understood that the development will include mechanical plant and HVAC equipment. At this stage, the detailed design and selection of mechanical plant is still underway. Preliminary assessment based on initial equipment selection is summarised below.

For other HVAC equipment, these can be treated using a combination of any of the following options:

- Selection of low noise units.
- Strategic location of equipment away from most sensitive receivers.
- Duct internal acoustic lining (where appropriate).
- Acoustic attenuators (where appropriate).
- Acoustic louvres.
- Acoustic barriers (if exceed the above recommendations).

For preliminary purposes a limiting aggregate sound power level of Lw 82 dB(A) is recommended to achieve the NPfI requirements at the nearest affected residential locations at night.

4.2 Operational Car Park

Based upon the data provided in the Parking and Traffic Consultants Traffic Assessment dated 11 May 2020, it is stated that provision for 334 car parking spaces will be provided on site, which is an additional 29 car spaces to the existing 305 car parking spaces.

To assess the noise impacts of site related noise emissions the following assumptions were made:

- It was conservatively assumed that all 334 car spaces would become full during a typical peak hour period, hence for a typical 15-minute assessment period, 25% of on-site car movements will occur i.e. 83.5 car movements in 15 minutes;
- Entry and exit points are via the western side of the site, at a distance of 18m to the nearest affected residential locations on Christie Street;
- Typical event time of 5 seconds, assuming 16m traverse at 10km/h;
- Using a typical vehicle L_{Amax} of 65 dB(A) at 8m;
- Typical carpark entry, diffuse field to free field correction of 6 dB(A);
- Predicted noise emissions based upon:

$$L_{Aeq} = SEL + 10\log N - 10\log T$$

where: $SEL = L_{Amax} + 10 \log ((0.5 \times (t_2-t_1)) / t_{ref})$

and: $t_{ref} = 1$ second

N = no. events in period T;

T = total time period under consideration in seconds;

(t_2-t_1) = duration of single event (s).

As shown in Table 6 during a typical peak usage for the car park during the Day period, conservatively predicted on site noise levels of 56 dB(A) which are predicted to comply with the NSW NPfI.

Table 6: Predicted on site traffic noise emissions to the nearest affected residential locations – Christie Street, LAeq 15minutes.

Location	Operational Carpark Noise, $L_{eq\ 15min}$	PNTL	Complies Yes/No
Day	56dB(A)	58 dB(A)	**Yes**

4.3 Building Façade

The traffic noise which has been used to design façade detailing has been taken from Insul 8.0 and is based on the ISO 717. This was used as the current traffic conditions are not considered normal due to the current COVID-19 pandemic which is causing reduced traffic on the roads, and hence data from both attended and unattended measurements were conservatively assumed to be higher than the measured traffic flow. The adopted design reference spectra for traffic noise levels is shown in Table 7.

Table 7: Design reference spectra for traffic noise, dB

Location	63Hz	125Hz	250Hz	500HZ	1 kHz	2kHz	4kHz	L_{Aeq}
Nicholson Street and Oxley Street	70	64	60	58	58	55	50	**62**

Detailed analysis indicates that the following transmission loss (TL) performance, shown in Table 8, will meet the requirements for 6/12/6 narrow cavity double glazing, which achieves a minimum of Rw 35 (for glazing and frames). These findings are subject to detailed design and the incorporation of thermal, façade and wind requirements.

Table 8: Acoustic façade system minimum sound transmission loss performance, dB

	63 Hz	125 Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Commercial Redevelopment	22	23	19	35	43	42	50

It is required that the façade shall incorporate the use of acoustic seals to maintain the acoustic performance of the glazing system. Acoustic performance of the glazing system is to be certified by an approved testing body and should be reviewed for approval before final confirmation.

5 CONSTRUCTION NOISE ASSESSMENT

5.1 Construction Methodology

The following has been assumed regarding noise intensive equipment/activities:

- Demolition works;
- Bulk Excavation;
- Disconnection and/or diversion of services;

For the assessment reference sound levels for representative equipment have been taken from the DEFRA, database. The documents include extensive databases of sound data covering trucks, excavators, hand tools and all manner of other construction equipment and activities. The ratings listed are for individual pieces of equipment at constant operation.

NDY have calculated the expected noise levels at each boundary for each phase of construction, based on assumed construction equipment and activities per phase, and permissible running times.

The calculations assume that all activities listed as operating for a particular construction phase are operating simultaneously.

The following four tables how the construction noise is proposed to comply at each of the nearby receivers, with the table showing noise control through each phase.

The tables incorporate specific noise mitigation measures to be implemented for various activities, including:

- Time management of activities to reduce the noise impact.

We have also included for reference:

- The construction noise limits applicable to each receiver;
- The benchmark noise levels applicable to each receiver (to allow comparison of construction noise impacts compared to the existing noise environment.

Table 9: Typical External Noise Levels of Demolition and Construction Machinery/Activity

Item #	Activity /Machinery	Source	Leq Sound Pressure Level at 10m (dBA)
Early Works Phase			
1	Tracked excavator, breaking up brick foundation (121kW, 15t)	DEFRA	90
2	Jack hammers	AS2436	93
3	Hand-held hydraulic breaker 20kg / 69bar	DEFRA	93
4	Backhoe mounted hydraulic breaker, breaking road surface (67kW)	DEFRA	88
5	Tracked excavator, loading dump truck	DEFRA	85
6	Tracked Excavator, Ground Excavation Works (25t, 125kW)	DEFRA	77
7	Crane mounted Screw Piler	DEFRA	79
Structural Works			
8	Tracked Crane	DEFRA	93
9	Bobcat, 5t	DEFRA	104
10	Truck Delivery	DEFRA	93

11	Concrete Pump, 25kW	DEFRA	103
Fit out Works			
12	Angle Grinder	DEFRA	109
13	Hammer	DEFRA	97

5.2 Predicted Construction Noise Impacts

Based upon the main works phases and assumed plant items during the various phases, the following predicted noise levels for different construction phases are presented below in Table 10, Table 11 and

Table 12.

Based upon the typical plant noise and vibration levels determined for the various phases of construction, it is anticipated that construction noise will be significantly higher than the allowable noise level in both the early works and structural phases. The construction noise levels during excavation phase are predicted to exceed 75 dB(A). Under the ICNG, this would support the requirements for construction noise to be managed as part of a construction noise and vibration management plan.

Table 10: Predicted Construction Noise, dB(A) – Early Works Phase

Receivers	Recommended Hours	Period	Predicted Construction Noise Level	External Noise Management Level [dBA]
Commercial premises	All Hours (Standard Construction Hours + Outside Standard Construction Hours)	When in use	75	56 (noise affected) 75 (highly noise affected)
Residential properties on Oxley Road (South of the site boundary)	Standard Construction Hours	Day	74	
Residential properties on Lithgow Street (West of the site)	Standard Construction Hours	Day	74	
NB: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.				

Table 11: Predicted Construction Noise, dB(A) – Structural Works Phase

Receivers	Recommended Hours	Period	Predicted Construction Noise Level	External Noise Management Level [dBA]
Commercial premises	All Hours (Standard Construction Hours + Outside Standard Construction Hours)	When in use	66	56 (noise affected) 75 (highly noise affected)
Residential properties on Oxley Road (South of the site boundary)	Standard Construction Hours	Day	69	
Residential properties on Lithgow Street (West of the site)	Standard Construction Hours	Day	69	
NB: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.				

Table 12: Predicted Construction Noise, dB(A) – Fit Out Works Phase

Receivers	Recommended Hours	Period	Predicted Construction Noise Level	External Noise Management Level [dBA]
Commercial premises	All Hours (Standard Construction Hours + Outside Standard Construction Hours)	When in use	46	56 (noise affected) 75 (highly noise affected)
Residential properties on Oxley Road (South of the site boundary)	Standard Construction Hours	Day	46	
Residential properties on Lithgow Street (West of the site)	Standard Construction Hours	Day	47	
NB: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.				

5.3 Predicted Construction Vibration Impacts

It is important to note that construction vibration levels depend on several factors. These include the activity, the machine, the geology of the ground and the distance between the building and the source. Surface works are expected to have a lower vibration impact than ground compacting/breaking works.

Compliance with vibration limits is expected based on ensuring ground compacting equipment is selected to adherer to minimum safe working distances. While these magnitudes do not predict cosmetic/structural damage, it is anticipated that human response/comfort would be impacted at these distances. The current RMS Construction Noise and Vibration Guideline sets safe working distances for vibrating plant and equipment. These are summarised below in Table 13. As shown, the use of large hydraulic hammers would not be recommended for these work, as there is an apartment building and several residences located within the 73m radius of discomfort caused by a large hydraulic hammer. Hence it is recommended that the use of smaller rock breakers and hand-held jackhammers are used for activity close to the nearest affected residential receivers.

Table 13: RMS Plant Vibration Safe Operating Distances – Construction Noise and Vibration Guideline 2016

Plant Item	Rating / Description	Minimum working distance	
		Cosmetic damage (BS 7385)	Human response (OH&E Vibration Guideline)
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Jackhammer	Hand held	1 m (nominal)	2 m

5.4 Construction Noise and Vibration

The findings of this assessment have determined that construction works, undertaken during standard hours will exceed the Highly Noise Affected criteria of 75 dB(A) or greater during construction works. Hence it is anticipated that a construction noise and vibration management plan will be required for these works. The findings have proposed that construction noise is managed through feasible and reasonable noise mitigation measures, outlined in the NSW Interim Construction Noise Guideline and Australian Standards 2436-2010. Additional site and noise management practices have been provided below for guidance purposes.

5.4.1.1 Construction Noise and Vibration Management Plan

Predicted construction noise levels were determined to exceed the 'Highly Noise Affected' noise levels, which have been specified in the Interim Guide for Construction Noise (ICNG) as requiring a construction noise and vibration management plan, to be implemented during the construction new commercial facility. The Interim Guide for Construction Noise (IGCN) list a number of typical best practice measures which can be used to reduce construction related impacts. In addition, Australian Standards 2436-2010 provides best practice measures to mitigate construction noise and vibration.

The following recommendations should be also considered in the development of a construction noise and vibration management plan for the site, when details of the contractor works methodology become finalised.

5.4.1.2 General/Site Management Issues

- All employees, contractors and subcontractors are to receive an environmental induction and should instruct all persons at the site with regard to all relevant project specific and standard noise mitigation measures, including but not limited to permissible hours or work, limitation of high noise generating activities, location of nearest affected noise receivers, construction employee parking areas, designated loading/unloading areas and procedures, site opening/closing times (including deliveries) and environmental incident procedures.
- A dedicated person will form a point of contact for dissemination of general information regarding site operations. Contact persons will also be defined to receive comment or complaints from the community.

5.4.1.3 Construction Activities and Mitigation

The following general construction noise source control measures may be required:

- Site access for construction vehicles to be set up away from the sensitive boundaries;
- During extended construction hours, less intrusive works will be scheduled to be carried out and/or works will be carried out away from sensitive receivers;
- Activities that approach the highly noise affected criteria for the residential receivers to be carried out during times where receivers are less sensitive to noise;
- Avoid unnecessary revving of engines and turn off plant that is not being used/required;
- Where possible organise the site so that delivery trucks and haulage trucks only drive forward to avoid the use of reversing alarms;
- Where possible, avoid using tonal reverse alarm outside standard construction hours;
- Organise and schedule the equipment operations to limit the noisiest machines operating simultaneously;
- Site set up/ movement of plant / delivery of material/ waste removal to site should generally be restricted to day period;
- Truck drivers are to be informed of site access routes, acceptable delivery hours and must minimise extended periods of engine idling;
- Ensure there is no unnecessary shouting or loud stereo/radios on site. There must be no dropping of metal from heights, throwing of metal items or slamming of doors;
- Use less noise intensive equipment where reasonable and feasible;
- Where practical fixed plant should be positioned as far as possible from the sensitive receivers;
- Use temporary site buildings and material stockpile as noise barrier;
- Employ the use of solid barrier plywood hoardings if required;
- Where practical, a partial enclosure shall be used to minimise noise levels.

5.4.1.4 Construction Noise Controls

General/ Work Practices:

- Avoid unnecessary revving of engines and turn off plant that is not being used/required.
- Where possible organise the site so that delivery trucks and haulage trucks only drive forward to avoid the use of reversing alarms.
- Where possible, avoid using tonal reverse alarm outside standard construction hours.
- Organise and schedule the equipment operations to limit the noisiest machines operating simultaneously.

- Site set up/ movement of plant / delivery of material/ waste removal to site should generally be restricted to daytime period.
- Truck drivers are to be informed of site access routes, acceptable delivery hours and must minimise extended periods of engine idling.
- Ensure there is no unnecessary shouting or loud stereo/radios on site. There must be no dropping of metal from heights, throwing of metal items or slamming of doors.
- Use less noise intensive equipment where reasonable and feasible.

Use and sitting of equipment/activities:

- Where practical fixed plant should be positioned as far as possible from the sensitive receivers.

Enclosures:

- Use temporary site buildings and material stockpile as noise barrier.
- Employ the use of solid barrier plywood hoardings – typically 4m high.
- Where practical, a partial enclosure shall be used to minimise noise levels.

5.4.1.5 Construction Vibration Controls

Structural Damage:

- Use lower impact or low tonnage equipment – use of small rock breakers.
- Maintain safety distance between construction plant and building, to be determined during detailed design stage.

Human Annoyance:

- Scheduling the use of vibration causing equipment at the least sensitive time of the day.
- Sequencing operations so that high vibration causing activities to do not occur simultaneously.

6 CONCLUSION

A noise and vibration impact assessment were undertaken for the proposed 29-57 Christie Street, St Leonards NSW development. Unattended measurements were used to determine criteria for this assessment, as advised by the local council despite the current COVID-19 pandemic restrictions. Noise and vibration impact to the NSR were determined to be an issue during the excavation phase of the development. It is anticipated that vibration issues can be mitigated by using smaller rock breakers and hydraulic hammers. Other noise impacts were determined to generally comply with noise and vibration criteria during day, evening and night-time periods. Recommendations for the office levels façade glazing have also been provided in this report.

The location of mechanical plant and equipment within the building is yet to be finalised, however, it is anticipated that noise emissions to the NSR can be controlled using standard engineering measures outlined in this report. Limiting aggregate sound power levels have been provided to facilitate mechanical plant detailed design.

Construction during the excavation phase of works on this site was predicted to have considerable noise and vibration impacts, and hence it has been recommended in this report that a noise and vibration management plan is prepared to mitigate and manage these impacts. This report has outlined typical best practice measures that should be considered in the development of a final noise and vibration management plan.

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