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Barber Avenue - Construction Noise Assessment

1 INTRODUCTION

We have been asked to provide comment on potential noise and vibration impacts on nearby development arising during construction of the subject development.

We note that a detailed construction program for the demolition, excavation and construction of the development is not available at present (this is not typically undertaken prior to project approval) and as such, a detailed construction noise assessment cannot be undertaken at this stage.

We recommend that a detailed assessment of noise emissions from construction activities be undertaken at Construction Certificate Stage, once a construction programme has been determined. As such, only an indicative analysis is possible, as outlined below.

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2 SITE DESCRIPTION / AFFECTED PROPERTIES

The proposed development is located at Barber Avenue, Kingswood and includes two stages and three separate mixed use buildings. Proposed works and noise sensitive properties are outlined below.

- Stage 1
    - Building A is bounded by the Great Western Highway to the north, which carries high volumes of traffic and by the Nepean Private Hospital to the east and south. The western façade of the property faces Stage 2 of the development. This building is proposed to be an 8 storey building and to include retail and commercial.
    - Building C is bounded to the south by Barber Avenue which carries medium to low volumes of traffic and to the east by the Nepean Private Hospital. The western façade faces stage 2 of the development and the northern façade is bounded by building A of the development. The building is proposed to be 8 storeys high with a mixture of residential, retail and commercial.
- Stage 2- Comprises of a 12 storey residential building bounded to the north by the Great Western Highway, to the west by Parker Street, which carries high volumes of traffic, and to the south by Barber Avenue. The eastern façade will face Building C of this development.

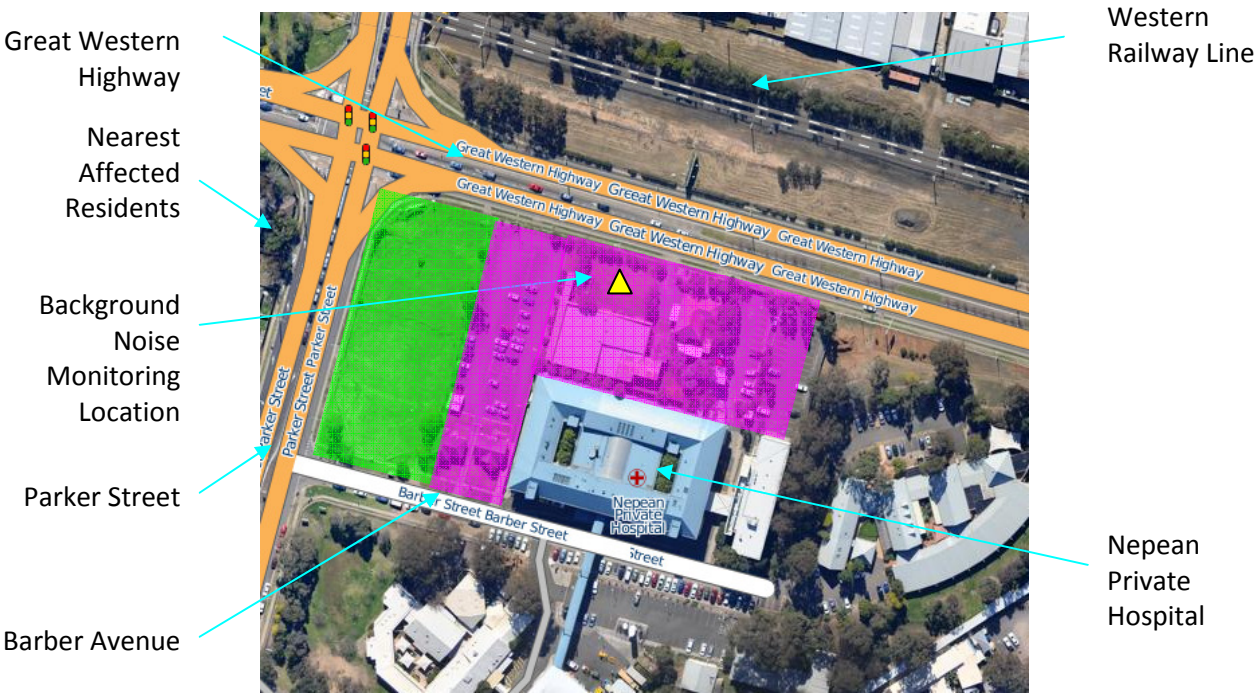

Figure 1 Site Map and Measurements Location

Stage 1

Stage 2

3 ACOUSTIC CRITERIA

Both noise and vibration criteria will be outlined below.

3.1 CONSTRUCTION NOISE

Relevant guidelines are:

- The DECCW Interim Construction Noise Guidelines and
- Australian Standard 2436.

3.1.1 DECC Interim Construction Noise Guideline

This guideline nominates acceptable levels of noise emissions above the background noise level. For projects within the recommended standard hours the guideline recommends a noise level of 10dB(A) above the background – this level is referred to as the "noise effected level". The noise emission goals for nearby development is as follows:

Table 1 – Noise Emission Goal – Residential Properties

TIME OF DAY	MEASURED BACKGROUND LEVELS – dB(A)L_{90}	NOISE EFFECTED LEVEL BACKGROUND + 10dB(A)$L_{eq(15min)}$
Day (7am-6pm)	56*	66

*This level has been determined based on long term on-site noise monitoring conducted at DA stage.

Table 2 – Noise Emission Goal – Hospital

TIME OF DAY	Noise Emission Goal dB(A)$L_{eq(15min)}$
Day (7am-6pm)	45 (internal noise level)*

*Assuming standard façade construction, and external noise level of 65-70dB(A) will result in an internal noise level of 45dB(A).

Where noise from the construction works is above the "noise affected level", the proponent should apply any feasible and reasonable work practices to minimise noise.

If noise emissions are likely to exceed 75dB(A)$L_{eq(15min)}$, the receiver is deemed to be "highly noise affected". Introduction of management controls such as scheduling of noisy periods, or respite periods is recommended.

3.1.2 Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site".

Where compliance with DECCW cannot be achieved, noise emissions are to be managed in accordance with principles in AS2436:

- That reasonable suitable noise criterion is established (ie – adopt DECC/Council guidelines).

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

3.2 VIBRATION

Vibration caused by construction should be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*
- For human exposure to vibration (amenity), the evaluation criteria presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment

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

3.2.1 Structure Borne Vibrations

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

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

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

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

3.2.2 Assessing Amenity

Department of Environment and Conservation NSW "Assessing Vibration: A Technical Guideline" (Feb 2006) is based on the guidelines contained in BS 6472:1992. This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings.

The recommendations of this guideline should be adopted to assess and regulate vibration within the construction site.

Table 4 - DECC Recommended Vibration Criteria

		RMS acceleration (m/s^2)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0

4 COMMENT / ASSESSMENT

Potential noise and vibration impacts are reviewed below.

4.1 NOISE IMPACTS

Obviously, noise impacts on nearby development will be dependant on the activity and where on the site the activity is undertaken. Excavation and piling works tend to be the loudest typical activity. Work close to the western boundary will have greatest impact on the residents on Parker Street while work in the south-eastern corner will have greatest impact on the Nepean Private Hospital.

Initial analysis indicates:

- Excavation/soil retention phase - Primary noise emissions occur during excavation and earth retention (piling), with equipment items typically having sound power levels of approximately 115dB(A)$L_{eq(15min)}$. Excavators (dozers with bucket, saws or hammers) and piling works are typically the loudest activity during construction. Noise levels of between 40-60dB(A) within the hospital and 60-75dB(A) at the nearest residents will potentially be generated, indicating that DECCW acoustic criteria (refer to tables 1 and 2) may be exceeded from time to time, with higher noise levels generated when working near the western and south-eastern boundaries of the site.

- During erection of structure, it is the use of hand tools (angle grinders etc) and concrete pumps which are the loudest typical activity (sound power levels of approximately 105dB(A)$L_{eq(15min)}$). Noise levels of between 30-50dB(A) within the hospital and 50-65dB(A) at the nearest residents will potentially be generated, indicating that a minor exceedance of

DECCW acoustic criteria (refer to tables 1 and 2) is possible from time to time, with higher noise levels generated when working near the western and south-eastern boundaries of the site.

- Obviously, once construction of the building shell is complete, noise from hand tools will be relatively low, as the new building façade will provide considerable noise attenuation. Once the building shell is largely complete, use of hand tools in internal areas is unlikely to exceed DECCW recommended levels.

Noise impacts can be minimised using the following:

- Selection of equipment and process.
- Location of static plant (particularly concrete pumps).
- Use of screens or enclosures (typically only feasible for static plant).
- Scheduling of noisy activities and provision of respite periods.

Detailed construction noise planning is typically undertaken after engagement of a builder and a construction program is prepared (ie – after DA stage) and therefore, detailed planning is not possible at this stage.

In light of the above, we recommend:

- During preparation of the construction program (CC stage), consult with Nepean Private Hospital to determine what areas of the hospital are particularly noise sensitive, and at what time (ward rooms, operating theatres etc).
- On completion of the construction program, acoustic review of proposed construction activities and plant/methods should be undertaken to identify work items likely to exceed DECCW guidelines.
- For those activities likely to generate high noise levels, the analysis should Identify where on the site are the areas likely to result in high noise levels. This will then assist in determining the likely time period for which high noise levels will occur.
- Identify feasible acoustic controls or management techniques (use of screens, scheduling of noisy works, notification of adjoining land users, respite periods) when excessive levels may occur.
- For activities where acoustic controls and management techniques still cannot guarantee compliant noise levels, implement a notification process whereby nearby development is made aware of the time and duration of noise intensive construction processes.

Through adoption of the above, noise impacts on nearby development can be suitably managed to prevent excessive impact.

4.2 VIBRATION IMPACTS

Excavation and earth retention works (piling) are the primary vibration generating activities.

Vibration impacts on the residential properties to the west are unlikely to exceed the criteria outlined in section 3.2

Due to its proximity, there is potential for higher levels of vibration to be generated at the Nepean Private Hospital. In particular, if excavating in rock or installing driven piles in close proximity to the façade of the hospital. We recommend:

- Consultation with Nepean Hospital prior to construction to determine if there is any particularly vibration sensitive equipment items on site, particularly near the northern or western facades (MRI, microscopes etc) in order to determine appropriate vibration criteria.

- Where practicable, excavation in rock should be done using rock saws as opposed to pneumatic hammers.

- If piling is required, use of augured or vibro piling should be used rather than impact piling.

- For at least the initial stages of excavation and piling, vibration monitoring at the Nepean Private Hospital should be conducted to ensure excessive levels of vibration are not achieved. Any monitoring system should allow for rapid feedback to the contractor (for example, SMS notification)in the event that excessive levels are reached.

Adoption of the above will provide a framework to ensure that appropriate systems for monitoring and management of vibration can be implemented.

5 CONCLUSION

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

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Thomas Taylor