Stage 1 Project, Shepherds Bay Urban Renewal, Meadowbank

Traffic and Rail Noise Assessment and Construction Vibration and Noise Impact Assessment

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1 INTRODUCTION

This report presents our assessment of potential traffic noise and railway noise impacts on the proposed Stage 1 Project residential development on the corner of Belmore St and Rothesay Avenue as a part of the Shepherds Bay Urban Renewal, Meadowbank.

In this report we will:

- Identify appropriate noise impact criteria.
- Present an acoustic assessment of external noise impactson the site and provide indicative acoustic treatments to the building shell.
- Identify appropriate criteria for construction noise generation and present noise emission goals.

The noise assessment is based on the architectural drawings presented in the table below.

Table 1 – Referenced Drawings and Reports

Consultant	Drawing Number	Date
Robertson and Marks Job no. 10068	A100/1	2011/12/12
	A 101/1	2011/12/12
	A 102/1	2011/12/12
	A 103/2	2011/12/12
	A 104/2	2011/12/12
	A 105/2	2011/12/12
	A 106/2	2011/12/12
	A 107/2	2011/12/12
	A 108/1	2011/12/12
	A 109/1	2011/12/12
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	A 113/1	2011/12/12
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	A 115/1	2011/12/12
	A117/1	2011/12/12
	A 118/1	2011/12/12
	A 119/1	2011/12/12
	A 120/1	2011/12/12
	A 121/2	2011/12/12
	A 122/1	2011/12/12
	A 123/1	2011/12/12

2 SITE DESCRIPTION / PROPOSAL

The proposed 11 storey residential development is located on the corner of Rothesay Avenue and Belmore Street which forms part of the Shephards Bay Urban Renewal, Meadowbank. The south eastern façade faces Belmore Street which is a two lane road primarily used for residential access. The south western façade faces Rothesay Avenue which is a two lane road primarily used for residential access, the north eastern façade faces Hamilton Crescent which is a two lane road primarily used for residential access, while the remaining north western facade is bounded by the existing commercial property.

Proposed works consist of the construction of a residential development. Land used in the vicinity of the site with the potential to generate noise and/or vibration impacts are as follows:

- Church Street, which lies approximately 200 metres to the south-east of the site, potentially affecting the southern-eastern façade and to perpendicular façade of any development on site.

- The Northern rail line, which lies 670 metres to the west of the site and will potentially generate a noise and vibration impact.

Additionally, noise sensitive receivers in the vicinity of the site (potentially affected by construction or operational noise from the site) are as follows:

- Residences property bounding the site to the north west;
- Residences on the south eastern side of Belmore Street;
- Residences on the northern side of Hamilton Crescent;

Refer to Figure 1 below, which is an aerial photo of the existing development.

Figure 1 – Site Location

SITE BOUNDARY

UNATTENDED RAIL NOISE MEASUREMENT LOCATION

UNATTENDED TRAFFIC NOISE MEASUREMENT LOCATION

3 NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15 minute period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

In the case of the LAeq (1 Hour) descriptor, the highest 10^{th}-percentile hourly (or L_{10}) A-weighted Leq noise level applies when the particular class of building/place is in use.

4 NOISE IMPACT ASSESSMENT

4.1 MEASUREMENTS

4.1.1 Traffic Measurement

Unattended measurements were conducted at the site, approximately 13m from Church Street (see figure 1) Measurements were conducted between 16th July 2010 and 26th July 2010. An Acoustic Research Laboratories Pty Ltd noise monitor was used. The monitor was programmed to store 15 minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of the measurements; no significant drift was detected. Measurements were taken on A-weighted fast response mode.

4.1.2 Measurement Location

The unattended traffic noise measurement was conducted at approximately 13m distance from Church Street. Traffic noise measurement locations are detailed above in figure 1.

4.1.3 Resultant Noise Levels

The following table presents the resultant noise levels at the proposed south eastern façade of the development facing Belmore Street. The noise levels are based on the unattended traffic noise measurement results adjusted by the difference calculated from distance attenuation between Church Street (where the unattended monitor was located) and the south eastern façade of the proposed development (facing Belmore Street).

Table 2 – Measured/Predicted External Traffic Noise Levels

Location	Daytime Level dB(A)$L_{eq(15hour)}$	Night time Level dB(A)$L_{eq(9hour)}$
South Eastern Façade (Facing Belmore St)	63	59

4.1.4 Train Measurement

The train noise measurements were obtained from Rothesay Avenue; approximately 425 metres from closest rail lines (see Figure 2). The unattended measurements were carried out from 16th July 2010 till 26th July 2010. An Acoustic Research Laboratories Pty Ltd noise monitor was used. The monitor was programmed to store 15 minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of the measurements; no significant drift was detected. Measurements were taken on A-weighted fast response mode.

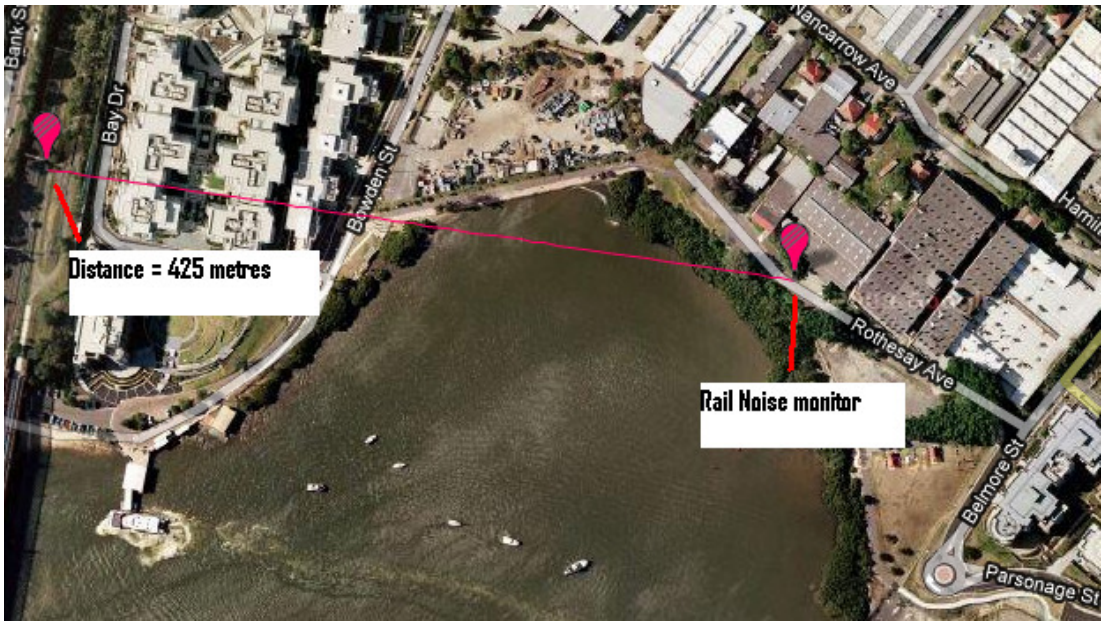


Figure 2 – Measurement location and distance from train line to monitor

Train noise was measured as described in Section 4. The following calculated noise levels (refer Table 3) were determined. Although due to distance of train line being greater than 60 metres from the development sites and other noise elements affecting the results (i.e. traffic from Church St, Ferries and inclement weather) train noise would have had no impact on these results.

4.1.5 Resultant Noise Levels

The following table presents the resultant noise levels at the proposed south western façade of the development facing Rothesay Avenue. The noise levels are based on the unattended rail noise measurement results adjusted by the difference calculated from distance attenuation between the unattended monitors location and the south western façade of the proposed development.

Table 3 – Measured/Predicted Rail External Noise Levels

LOCATION	TIME OF DAY	$L_{Aeq\ (1\ hour)}$ dB(A)
South Eastern Façade (Facing Rothesay Avenue)	Day (7am-10pm)	55
	Night (10pm-7am)	50

4.2 FUTURE TRAFFIC STUDY

"Traffic and Transport Assessment" report by Varga Traffic Planning dated 14th October 2010 with reference number: 09260 provided the following information:

Project Traffic Generation

Based on the traffic generation rates nominated in the RTA Guidelines the proposed Shepherds Bay Urban Renewal Project is expected to result in an increase in the traffic generation potential of the precinct of approximately 150 vph, as set out in the table below.

Table 4 – Traffic Study Results

Shepherds Bay Precinct **Project Nett Increases in Traffic Generation Potential**		
Proposed Residential Uses Less Existing Industrial Use		
	If Industrial Was Fully Occupied	With Current Vacancy factor
Proposed Residential Uses Less Existing Industrial Use	870 vph -720 vph	870 vph -427 vph
	+150 vph	+443 vph

4.3 NOISE ASSESSMENT CRITERIA

4.3.1 Traffic Noise Assessment Criteria

Traffic noise controls relevant to the site are as follows:

- Section 26.5 of DCP 48 (Medium Density Development) requires noise attenuation treatments for dwellings close to arterial roads or train lines.

- SEPP Infrastructure 2007 (as cited in the Department of Planning Development near Rail Corridors and Busy Roads Interim Guidelines) also applies.

Of the above guidelines, it is SEPP Infrastructure which is the most stringent, and will be applied for this assessment.

Table 5 – Internal Noise Level Criteria (SEPP Infrastructure)

LOCATION	CRITERIA
Bedroom	35dB(A)$L_{eq(9hour)}$
Living areas	40dB(A)$L_{eq(15hour)}$

The Department of Planning Guidelines make no reference to acoustic criteria for external areas. However (not mandatory) guidelines for noise impacts on external spaces are set out in the DECC Environmental Criteria for Road Traffic Noise, as presented below.

Table 6 – External Noise Criteria

LOCATION	CRITERIA
Passive Recreation Areas	55dB(A)$L_{eq(9hour)}$

4.3.2 Train Noise Assessment Criteria

The train noise intrusion into the residential development shall comply with the requirements of NSW Government Department of Planning "Development near Rail Corridors and Busy Roads"- Interim Guideline which has been detailed as below.

The noise criteria for residential buildings in Table 7 below for both road and rail are specified in the infrastructure SEPP. These criteria apply to all forms of residential buildings as well as aged care and nursing home facilities.

Table 7 – Internal Noise Criteria

Type of Occupancy	Applicable Time Period	Noise Level $L_{Aeq,1hr}$ dB(A)
Sleeping Areas (bedroom)	Night (10pm-7am)	35
Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	At any time	40

If internal noise levels with windows or doors open exceed the criteria by more than 10 dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia.

Generally, ground borne noise is associated more closely with rail operations than roads. Where buildings are constructed over or adjacent to land over tunnels, ground borne noise may be present without the normal masking effect of airborne noise. In such cases, residential buildings should be designed so that the 95th percentile of train pass-bys complies with the ground borne LAmax noise limit of 40 dB(A) (day time) or 35 dB(A) (night time) measured using "slow" response time setting on a sound level meter.

As a general guide, ground borne noise may be an issue in habitable rooms which are shielded from airborne noise from railway. Examples are rooms that are not facing railway, and where cuttings or noise barriers block the line of sight between the receivers such as suspended slab scan lend to vibration amplification.

4.4 RECOMMENDATIONS

Traffic noise intrusion into the proposed development was assessed using the measured external noise levels reported above as a basis.

Calculations were performed taking into account the orientation of windows, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted. Acoustic treatment required to ensure compliance with the assessment criteria are detailed in this section.

Internal noise levels will primarily be as a result of noise transfer through the windows and doors as these are relatively light building elements that offer less resistance to the transmission of sound. Noise transfer through the masonry elements will not be significant and need not be considered further.

The constructions necessary to achieve the noise levels are detailed below. The predicted noise levels have been based on the expected level and spectral characteristics of the external noise, the area of building elements exposed to traffic noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

4.4.1 Glazed Windows and Doors

The following constructions are recommended to comply with the naturally ventilated traffic noise objectives stated in Section 4.2, for both the windows open and windows closed criteria. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria listed below.

Table 8 – Recommended Glazing Constructions

Floor	Façade	Unit	Room Type	Glazing	Seals
Upper basement, Lower Ground, Ground, 1, 2, 3, 4, 5 & 6	Eastern (facing Belmore Street)	All	Bed	6.38mm Laminated	Yes
			Living Areas	6.38mm Laminated	
	Northern, Southern, Western and Windows facing into the development	All	Bed	4mm Toughened	Yes
			Living	4mm Toughened	No
7, 8, 9, 10 & 11	Eastern (Facing Belmore Street)	xx-01	Bed	6.38mm Laminated	Yes
	Eastern & Northern (Facing Belmore Street and Hamilton Cresent)	xx-06	Bed	10.38mm Laminated	Yes
	Eastern & Southern (Facing Belmore Street and Rothesay Avenue)	xx-01, xx-06	Living	6.38mm Laminated	Yes
	Remaining Northern, Southern, Western and Windows facing into the development	All	Bed	4mm Toughened	Yes
		All	Living	4mm Toughened	No

Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

In addition to complying with the minimum scheduled glazing thickness, the STC rating of the glazing fitted into open-able frames and fixed into the building opening should not be lower than the values listed in Table 9 for all rooms. Where nominated, this will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant. Note that all these windows are assumed as aluminium awning windows and mohair seals in windows and doors are not acceptable where acoustic seals are required.

5 CONSTRUCTION VIBRATION AND NOISE IMPACT ASSESSMENT

5.1 CONSTRUCTION VIBRATION IMPACT CRITERIA

Department of Environment and Conservation NSW "Assessing Vibration: A Technical Guideline" (Feb 2006) will be used to assess human discomfort caused by vibration generated by demolition activities. Vibration Criteria for building damage will be based on the following as detailed in Table C1.1 of aforementioned guideline.

Table 9 – DEC NSW 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

Note 1: Continuous vibration relates to vibration that continues uninterrupted for a defined period (usually throughout the daytime or night-time), e.g. continuous construction or maintenance activity. (DECC, 2006)

Note 2: impulsive vibration relate to vibration that builds up rapidly to a peak followed by a damped decay and that may or may not involve several cycles of vibration (depending on frequency and damping), with up to three occurrences in an assessment period, e.g. occasional loading and unloading, or dropping of heavy equipment. (DECC, 2006)

5.2 CONSTRUCTION NOISE IMPACT CRITERIA

It is proposed to adopt criteria from the New South Wales Construction Noise Guideline developed by The NSW Department of Environment, Climate Change and Water (DECCW) in conjunction with AS2436-1981 *"Guide to Noise Control on Construction Maintenance and Demolition Site"*.

5.2.1 Australian Standard AS2436:1981 "Guide to noise control on construction, maintenance and demolition sites

The Australian Standard AS2436 states that where all reasonable and available measures have been taken to reduce construction noise, mitigation strategies may be put in place to reduce levels noise levels to within a reasonable and acceptable level.

For the control and regulation of noise from construction sites AS2436:1981 *"Guide to noise control on construction, maintenance and demolition sites"* nominates the following:

a. That reasonable suitable noise criterion is established,

b. That all practicable measures be taken on the building site to regulate noise emissions, including the sighting of noisy static processes to locations of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours, and

c. The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the demolition, excavation and construction site.

5.2.2 DECCW Interim Construction Noise Guideline

The Department of Environment, Climate Change and Water in their recognition that previous construction noise criteria used by the former NSW Environmental Protection Authority (EPA) was unworkable, have developed a specific construction noise guideline in the aid of reducing the impact of construction associated noise.

The guideline reflects on feasible and reasonable mitigation strategies, management controls and public liaising in the effort to reach realistic comprises between construction sites and potential noise affected receivers.

5.2.2.1 DECCW Construction Noise Guideline - Qualitative Assessment Method

The guideline refers to a qualitative assessment method in which construction noise is assessed on a case by case basis with regard to various activities to be conducted on site. This assessment method was developed to smaller scale projects.

Essentially this method of assessment requires that the proponent take into consideration and employ all reasonable and feasible measures to ensure that the impact on noise receivers is minimised. This is generally conducted in the following manner:

- The drafting of a noise management plan outlining all reasonable and feasible mitigation methods for the reduction of noise impact;
- The assessment of high impact equipment such as rock-hammers and sheet pilers for lower noise producing methods of construction/excavation;
- The implementation of a complaints handling register and community consultation system;
- Employee (builders, contractors etc) education in effective noise reducing techniques and site etiquette; and
- The operation of plant in a quiet and efficient manner (i.e. turning off machinery when not in use).

This qualitative assessment method has been used for the basis of this report and will be discussed in detail.

In addition, the guideline specifies criteria which can be used in the effort of minimising noise from construction related activities.

Table 10 – DECCW Recommended Construction Noise Criteria

Noise criteria	Receiver	External sound level, $L_{eq\ 15\ min}$ dB(A)
DECCW	Residential	Background + 10dB(A)[1]
		75dB(A)[2]

1: Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. (DECCW CNG, 2008).

2: 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. (DECCW CNG, 2008).

These criteria for resultant noise from excavation activities are aimed at maintaining comfort levels within the surrounding residential dwellings. Additionally, noise mitigation techniques as discussed in Section 5 should be used if noise emissions exceed the above criteria. All work is to be carried out in accordance with AS 2436:1981 *"Guide to noise control on construction, maintenance and demolition sites"*.

5.2.2.2 Construction Hours

Construction hours should be carried out in accordance with recommended construction hours detailed in the DECCW Construction Noise Guideline which details the following:

- 7am to 6pm Monday to Friday; and
- 8am to 1pm Saturday.

5.3 RECOMMENDATIONS

Noise impacts as a result of construction noise should be generally compliant with the DECCW Interim Construction Noise Guidelines.

As with any major construction site, there will be noise impacts associated with demolition and construction. The management of impacts arising from these activities is now routine practice, both to address impacts to surrounding properties, and for commercial reasons, to limit impacts on retail tenancies.

The requirement for a noise management plan to be developed prior to works commencing is not uncommon and may be considered in this case for inclusion into the consent conditions.

Adequate control of construction noise can be achieved through the development of a Demolition and Construction Noise Management Plan which may be required to be undertaken prior to works commencing. Through implementation of a CNMP, noise and vibration impacts on nearby development can be minimised as is consistent with DECCW guidelines.

Preparation of this plan may be considered at Construction Certificate stage once construction programme and methodology have been determined.

6 CONCLUSION

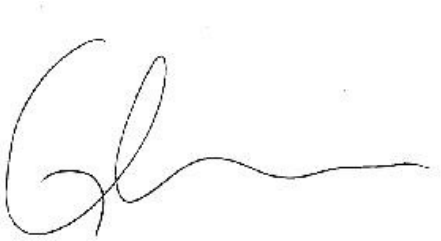
This report presents our assessment of potential traffic noise and railway noise impacts on the proposed Stage 1 Project residential development on the corner of Belmore St and Rothesay Avenue as a part of the Shepherds Bay Urban Renewal, Meadowbank. This report also outlines the potential noise and vibration impact from construction on this development site.

Noise impacts from nearby sources (primarily traffic noise) have been assessed in accordance with criteria set out in the Department of Planning Development near Rail Corridors and Busy Roads Interim Guidelines. Provided that the recommendations set out in section 4 of this report are adopted, the impact of traffic and rail noise will be reduced and comply with the Interim Guidelines requirements and therefore noise impacts will be satisfactory.

We have also assessed the likely impact of construction noise and vibrations against the requirements outlined in the DECCW Interim Construction Noise Guidelines and DEC NSW Assessing Vibration: A Technical Guideline. Provided that the recommendations set out in Section 5 of this report are adopted, the impact of noise and vibration during construction will also be satisfactory.

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

Yours faithfully,



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