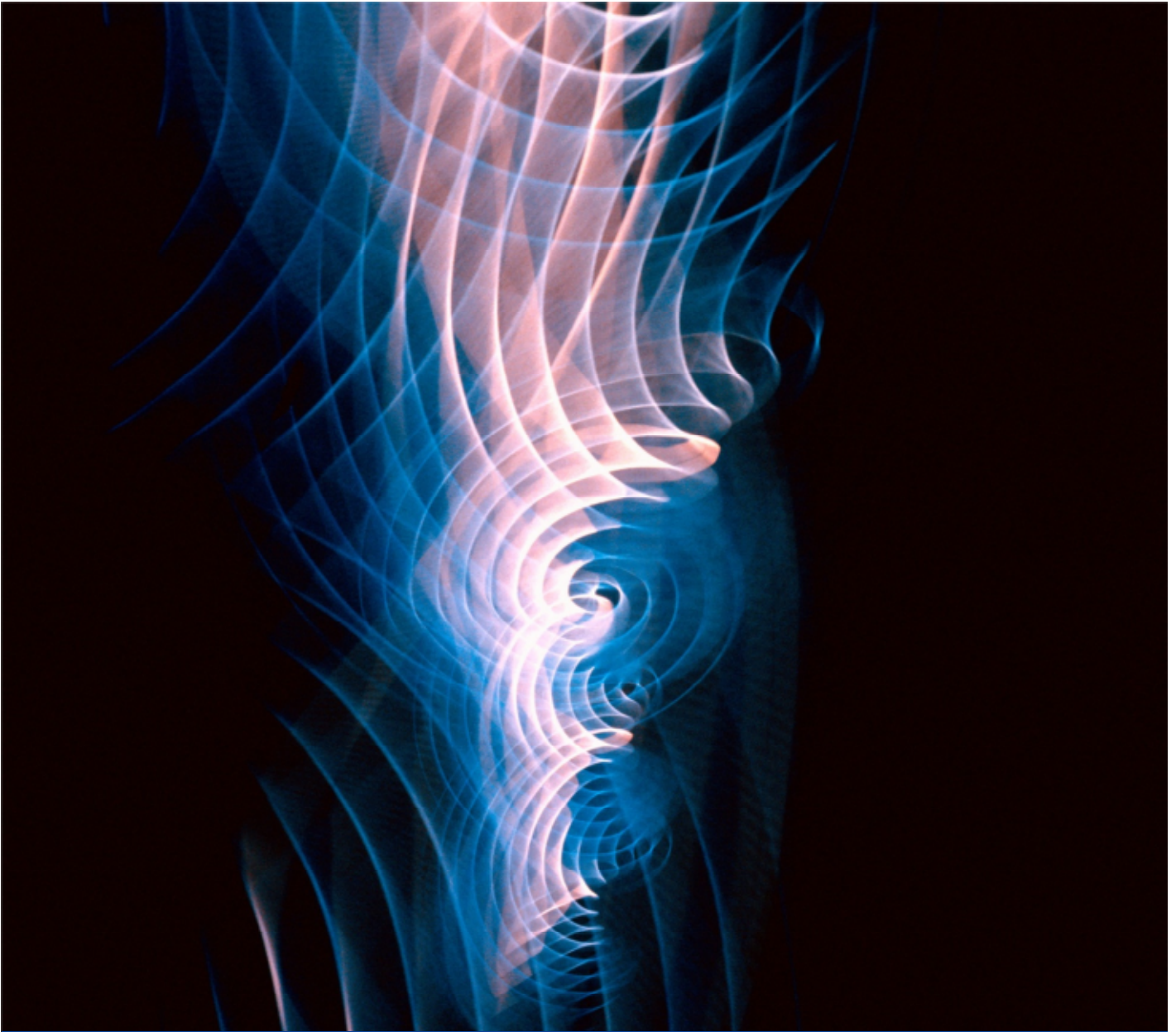




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NORTH EVELEIGH AFFORDABLE HOUSING

Noise Assessment

2013-03-08

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2013-03-27

Quality Management

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North Eveleigh Affordable Housing Noise Assessment

2013-03-08

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1 Introduction

WSP Acoustics have been appointed to carry out a noise impact assessment for the North Eveleigh Affordable Housing Project located in Eveleigh, NSW.

This noise impact assessment is required as part of the Development Application for the proposed development.

This document provides information on the following:

- Site description
- Description of relevant local noise criteria
- Noise survey results
- Noise and vibration assessment
- Construction noise and vibration assessment

1.1 Site description

The site for the proposed development is located on the northern side of Eveleigh, NSW. The site is bound by rail to the south and Wilson Street to the north; residential properties residing along the west and commercial buildings to the east.

Figure 1-1 - Site Description



2 Criteria

The following documents are cited in the Director General's Requirements (DGR's) for the development and hence form the basis for this noise assessment:

- NSW Industrial Noise Policy 2000 (Environment Protection Authority EPA)
- Interim Construction Noise Guideline (Department of Environment and Climate Change)
- Rail infrastructure Corporation (Railcorp) - Interim Guidelines for Applicants – Consideration of Rail Noise and Vibration in the Planning Process
- Rail infrastructure Corporation (Railcorp) – Interim Guidelines for Councils – Consideration of Rail Noise and Vibration in the Planning Process

2.1 Noise Emissions

The industrial noise policy sets a project specific noise level applicable to each project. The more onerous of two types of criteria form the project specific noise levels. These two criteria are; one to account for intrusive noise and the other to protect the amenity of particular land uses.

2.1.1 Intrusiveness criteria

Table 2-1 - Intrusiveness criteria

Period	(Min L_{90} + 5dB)
Day - 7am to 6pm	49
Eve – 6pm to 10pm	50
Night – 10pm to 7am	49

2.1.2 Amenity criteria

Table 2-2 - Amenity criteria

Receiver type	Day (acceptable – maximum)	Evening (acceptable – maximum)	Night (acceptable – maximum)
Commercial (when in use)	65 – 70	n/a	n/a
Residential Urban	60-65	50-55	45-50

2.1.3 Project Specific criteria

Based on most onerous levels for each period, the following criteria have been established as the project specific criteria.

Table 2-3 - Project Specific criteria

Receiver Type	Day L_{Aeq} (dBA)	Evening L_{Aeq} (dBA)	Night L_{Aeq} (dBA)
Commercial (when in use)	65-70 (amenity criteria)	n/a	n/a

Receiver Type	Day L_{Aeq} (dBA)	Evening L_{Aeq} (dBA)	Night L_{Aeq} (dBA)
Residential	49 (Intrusiveness criteria)	50 (amenity criteria)	49 (Intrusiveness criteria)

2.2 Internal Noise Criteria

2.2.1 Railcorp criteria

As per the director generals conditions of consent C10, Railcorp's guidelines have been established as the criteria to ensure the amenity of the buildings' occupants/residents is protected. The following noise levels apply in any habitable room within the development. If noise levels were to exceed the windows/doors open criteria then the design of the ventilation should be such that occupants can leave the windows/doors closed, if they so desire.

Table 2-4 - Railcorp - Interim guidelines for applicants - Airborne noise criteria

	Internal Space	Time period	Internal Noise Level L_{Aeq} (1hour) (dBA)
Windows/Doors closed	Living and sleeping areas	Day (7am to 10pm)	40
		Night (10pm -7am)	35
Windows/Doors Open	Living and sleeping areas	Day (7am to 10pm)	50
		Night (10pm -7am)	45

2.3 Vibration Ingress

As per the Director General's conditions of consent C10, Railcorp's guidelines have been taken for the vibration ingress criteria.

Within Railcorp's guidance, the floor vibration levels in habitable rooms should comply with the criteria in British Standard 6472:1992 '*Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80 Hz)*'.

Intermittent vibration assessment (e.g. trains) is based on vibration dose value (VDV in $m/s^{1.75}$) or the r.m.s value of the frequency-weighted acceleration measured at the relevant places of interest.

Table 2-5 British Standards 6472 – 'Table 1' Assessment of vibration

Place and time	Low probability of adverse comment ($m.s^{-1.75}$)	Adverse comment possible ($m.s^{-1.75}$)	Adverse comment probable ($m.s^{-1.75}$)
Residential buildings 16h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

2.4 Construction Noise & Vibration

2.4.1 Noise

The construction noise and vibration criteria have been taken from the Department of Environment and Climate Change 'Interim Construction Noise Guideline:2009'.

The rated background level (RBL), taken from the industrial noise policy shown in Table 3-3, is used to determine the management level for construction. As a guide the difference between the internal noise level and the external noise level is typically 10 dB with windows open for adequate ventilation.

Figure 2-1 - Table 2 taken from the Interim Construction Noise Guideline (DECC) criteria

Table 2: Noise at residences using quantitative assessment

Time of day	Management level L _{Aeq} (15 min) *	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured L_{Aeq} (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. - The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. - Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: - times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or 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.
Outside recommended standard hours	Noise affected RBL + 5 dB	- A strong justification would typically be required for works outside the recommended standard hours. - The proponent should apply all feasible and reasonable work practices to meet the noise affected level. - Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. - For guidance on negotiating agreements see section 7.2.2.

Applying the RBL the following management levels have been derived and create the noise trigger levels for this project:

Table 2-6 – Management Trigger Levels at Residences:

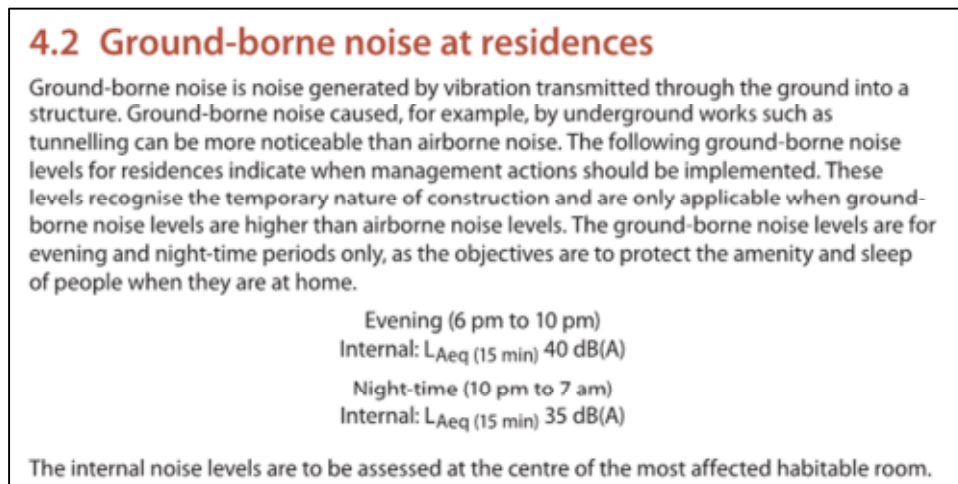
Time of day:	Management Trigger Levels	
	Noise Affected LAeq(15min) dBA	Highly noise affected:
Standard Hours Monday to Friday: 7am to 6pm Saturday: 8am – 1pm	54 (RBL +10)	75dB
Outside standard hours	49 (RBL + 5)	n/a

Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting the noise level is at the most noise-affected point within 30m of the residence.

2.4.2 Vibration

The following figure is the only relevant vibration criteria in the Interim Construction Noise Guideline, as there will be no blasting onsite. This criterion concerns noise at residences caused by vibration during the hours of 6pm to 7am. During these times it is expected that no significant vibration generating activities will be undertaken and therefore no ground-borne noise created.

Figure 2-2 – Taken from Interim Construction Noise Guideline (DECC) Ground-borne noise criteria



3 Prevailing Noise & Vibration Environment

The site location for the prevailing noise measurement was on the northern side of Eveleigh, NSW. The survey was undertaken from 9:00hrs on the 18/02/2013 to 12:00hrs on the 19/02/2013. Consideration was taken to place the sound level meters in locations to best represent the existing noise levels of the area.

The measurements of noise made during this visit were conducted in accordance with AS 1055 “Acoustics—Description and Measurement of Environmental Noise”. Class 1 sound level meters as described by IEC 61672-01:2002 were used.

Metrological conditions for the duration of the noise survey were conducive to the measurement of environmental noise, being predominantly dry and little wind.

Figure 3-1 - Measurement locations



3.1 Background Noise & Vibration Survey

Table 3-1 - Equipment used

Equipment Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
Sound Level Meter	Norsonic – Nor140	1404791	21/10/2013
Microphone	Norsonic - 1227	14105	21/10/2013
Preamplifier	Norsonic – 1209	14105	21/10/2013

Equipment Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
Vibration logging kit	Svantek – Svan-958	14295	01/08/14
Triaxial transducer	SV 207	119	01/08/14
Calibrator 1	Pulsar Model 105	55041	06/11/13
Calibrator 2	BSWA Tech	CA114	24/05/13

The sound level meter was fitted with a windshield during the survey and was calibrated prior to, and on completion of the survey with the associated acoustic calibrator listed above. No significant calibration drift occurred.

3.2 Noise Results

Shown in Table 3-2 below are the summarised measured background noise levels adjusted as per Railcorp's criteria time periods.

Table 3-2 – Measured Noise Levels (Railcorp's time periods)

	Background Noise level L ₉₀ (dBA)	Noise Level L _{Aeq} (dBA)
Day (7am – 10pm)	46.6	55.3
Night (10pm – 7am)	46.2	52.4

Shown in Table 3-3 below are the measured background noise levels and Rated Background Noise Levels (RBL) adjusted as per the Industrial Noise Policy's time periods.

Table 3-3 - Measured noise levels (INP time periods)

	Average Background Noise level L ₉₀ (dBA)	Rated Background Noise Level MIN.L ₉₀ (dBA)
Day (7am – 6pm)	46.1	44.3
Eve (6pm – 10pm)	46.4	45
Night (10pm – 7am)	45.9	43.6

3.3 Predicted Noise on Development Facades

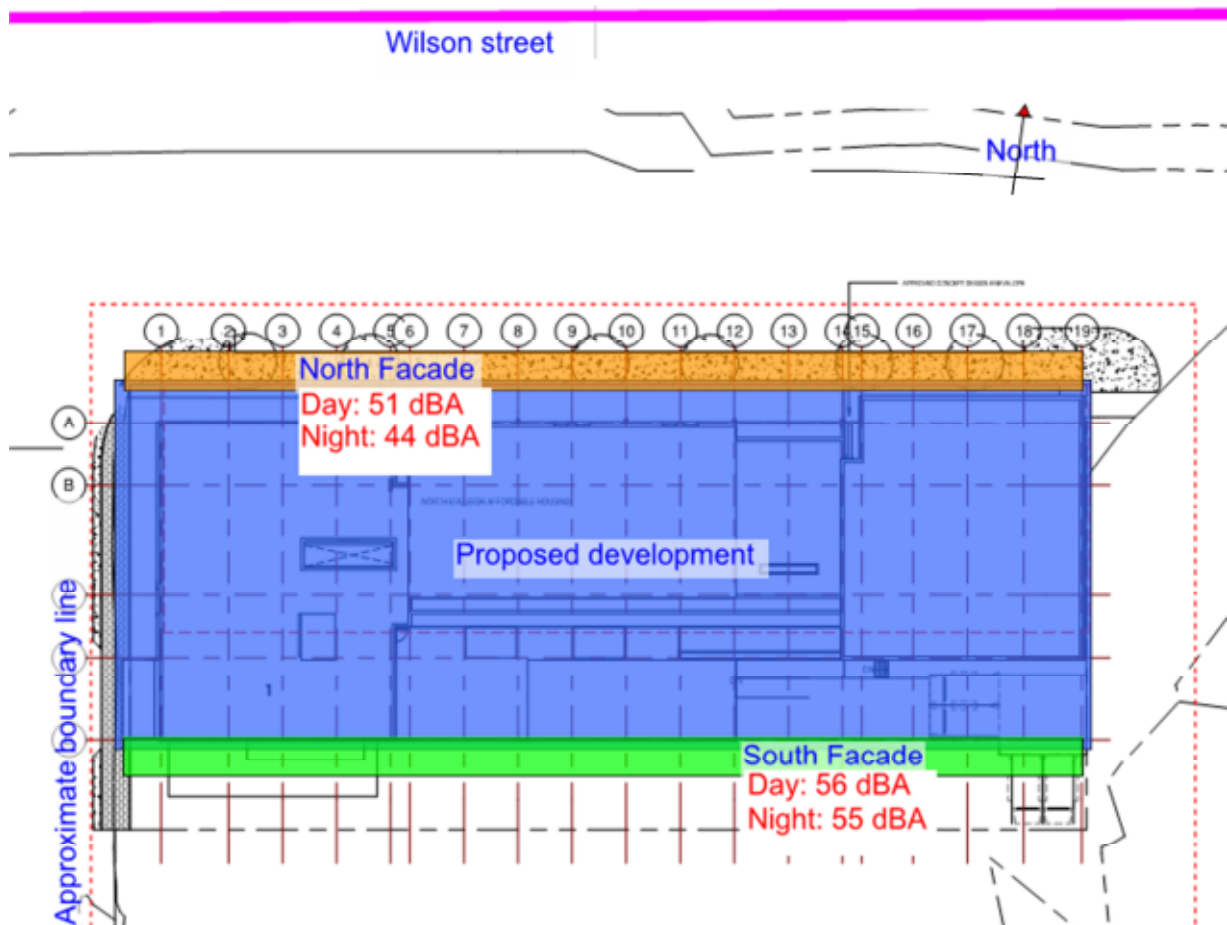
Noise levels at the proposed building facades have been predicted based on the following parameters:

- Measured background noise levels
- Traffic flow data obtained from the Transport Assessment 'City West Housing Pty Ltd North Eveleigh Affordable Housing Project (SSD_55708) January 2013.

Table 3-4 - Predicted noise levels on development facades

	South Façade (dBA)	North Façade (dBA)
Day (7am – 10pm)	56	51
Night (10pm – 7am)	55	44

Figure 3-2- Predicted noise levels on development facades



Note, the east and west facades fall within the ranges of the north and south facades.

3.4 Vibration results

The estimated VDV have been calculated for individual train pass-bys measured on site, these are as follows:

Table 3-5 - Rail vibration results

Sample	Description	eVDV Occurrence	eVDV Day (18h)	eVDV Night (8h)
Test 1	Sample train - fast speed	0.00482	0.0294	0.02282
Test 2	Sample train - fast speed	0.00187	0.01144	0.00885

Sample	Description	eVDV Occurrence	eVDV Day (18h)	eVDV Night (8h)
Test 3	Sample train - medium speed	0.00564	0.03446	0.02667
Test 4	Sample train - fast speed	0.00770	0.04706	0.03642
Test 5	Sample train - fast speed	0.00577	0.03529	0.02731

The eVDV day(18h) and night(8h) were calculated using flow data obtained from the Transport Assessment 'City West Housing Pty Ltd North Eveleigh Affordable Housing Project (SSD_55708) January 2013, as below:

- Day time train events: 1394
- Night time train events: 500

The worst case test sample have been combined with the flow data to produce the day and night eVDV results for comparison with the criteria .these are shown below:

Table 3-6 - Worst case vibration results

Single eVDV Occurrence	eVDV Day (18h)	eVDV Night (8h)
0.00770	0.04706	0.03642

Comparing these with the criteria provided in Section 2.3 it is seen that these are below the required daytime and night time levels by a factor of 10. Therefore this is not considered an issue for this development.

4 Development Noise & Vibration Assessment

4.1 Operational Noise Emission Limits

Plant noise emissions are subject to the project specific noise levels from the Industrial Noise Policy criteria in Section 2.1.3 and will be achieved through equipment selections and placement.

Upon design development, if the predicted noise levels increase due to changes in equipment needs, acoustic mitigation measures may be necessary. These measures may include, but are not limited to;

- Attenuators
- Noise barriers
- Acoustic louvres
- Acoustic absorption

4.2 Development Façade Design

4.2.1 North façade

To achieve the internal noise criteria in Section 2.2, the following minimum requirements are recommended:

Glazing/glass doors

Glazing areas along the North facade should have a minimum rating of R_w 32dB. The following table shows the reduction index spectrum for a R_w 32dB glazing.

Table 4-1 - North Façade - Recommended minimum glazing noise reduction

North Façade - Glazing Noise Reduction Spectrum for a R_w 32dB (dB) glazing								
Frequency	63	125	250	500	1K	2K	4K	8K
R	17	21	25	31	35	30	36	36

This can typically be achieved with min. 6mm well sealed single glazing. Should double glazing be required for thermal / sustainability / energy purposes, the minimum thickness of one of the panes should be at least 6mm. The reason for this is that at low frequency double glazing only performs as well as the thinnest layer of glass.

Solid sections

Solid sections of the façade are recommended to have a minimum rating of no less than the glazing specification, R_w 32dB.

4.2.2 South façade

To achieve the internal noise criteria in Section 2.2, the following minimum requirements are recommended:

Glazing

Glazing areas along the South facade should have a minimum rating of R_w 36dB. The following table shows the reduction index spectrum for a R_w 36dB glazing.

Table 4-2 - South Façade – Recommended minimum glazing noise reduction

South Façade - Glazing Noise Reduction Spectrum for a R_w 36dB (dB) glazing								
Frequency	63	125	250	500	1K	2K	4K	8K
R	25	26	28	34	36	38	44	44

This can typically be achieved with min. 10mm well sealed single glazing. Should double glazing be required for thermal / sustainability / energy purposes, the minimum thickness of one of the panes should be at least 10mm. The reason for this is that at low frequency double glazing only performs as well as the thinnest layer of glass.

Solid sections

Solid sections of the façade are recommended to have a minimum rating of no less than the glazing specification, R_w 36dB.

Doors

Along the south the doors form part of the external skin of the façade and therefore should have a minimum rating of R_w 30dB.

4.3 Ventilation Strategy

Natural ventilation throughout the development is the proposed strategy. The predictions are based on openings providing a 5dBA noise reduction from outside to inside. This is considered a conservative estimate. Note that with a natural ventilation strategy employed, a 10 dB relaxation in noise criteria applies as per Section 2.2.1.

Daytime:

Cross-flow ventilation is provided through openings on the north and/or south.

Night-time:

Ventilation throughout the unit is provided from openings on the north and/or east/west façades ensuring that opening sizes to each space meet the Building Code of Australia ventilation requirements. This allows the occupants to have the openings on the south closed during the night time and therefore preventing the noise levels exceeding the criteria.

With the above strategy in place the internal noise criteria in Section 2.2.1 is achievable.

4.4 Site Activity Noise

There are currently no commercial operations nearby; therefore the traffic noise will be suitably mitigated by the glass provisions provided in the above sections. However, it is a possibility that an increase in nearby commercial operations will produce an increase in site activity noise. To mitigate this increase the north façade glazing requirements could be specified to match the south façade requirements.

4.5 Vibration Ingress

Vibration levels are a factor of 10 below the criteria and as such there will be no adverse effects caused from rail vibration.

5 Construction Noise & Vibration

The following is an outline assessment provided for information at this stage. A detailed assessment will need to be undertaken once the main contractor is appointed and additional detailed construction methods are known.

5.1 Construction Methodology

Piling is expected to be carried out along the west boundary and excavations along the other three boundaries. It is assumed that 1 piling location and 2 excavators will be working at the same time and therefore the noise predictions are based on the following equipment and observations:

Activity on site:

- 1 x Large piling rig (along the west boundary)
- 2 x Tracked excavator (various locations)

No activity on site:

- Existing noise from general activity in the area

5.2 Predicted Levels

A computer model of the site and expected construction activity has been produced. This has taken into account the heights of the existing buildings and site topography.

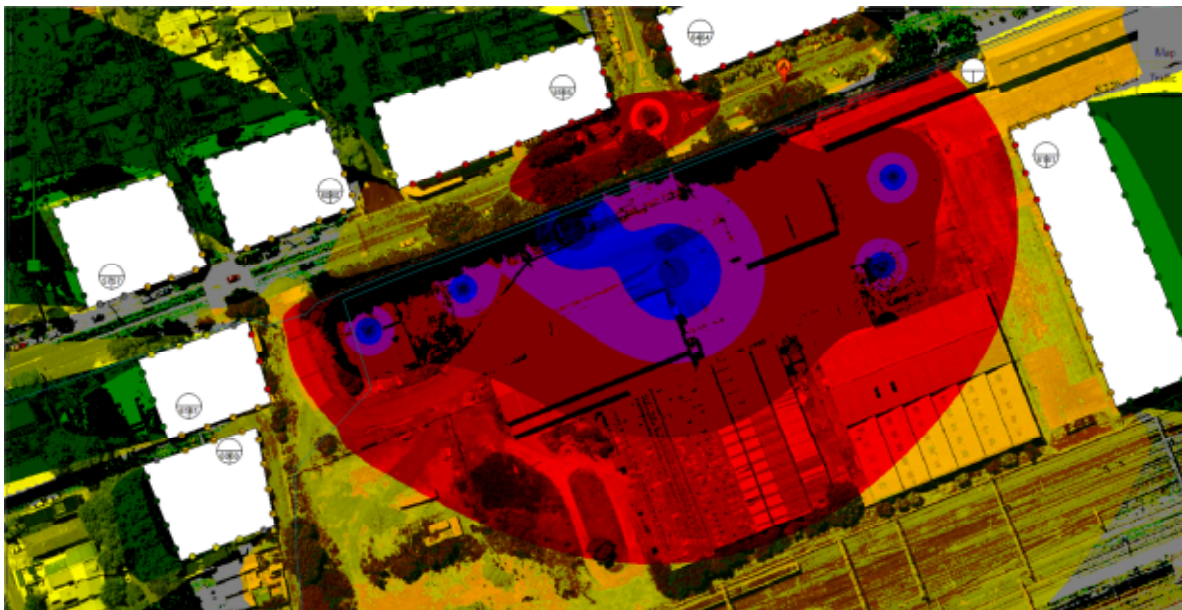
Table 5-1 - Noise Receivers location



Table 5-2 - Predicted site activity noise levels

Receiver	Predicted construction noise levels	
	No site construction activity (dBA)	Construction activity on site (dBA)
Residential 1	60	61
Residential 2	53	65
Residential 3	50	64
Commercial 1	53	61

Figure 5-1 - Construction activity on site - Noise map



5.3 Assessment

5.3.1 Noise

Comparing the predicted noise levels of construction activity onsite is it expected to exceed the noise affected management trigger of 54dBA

The noise affected management trigger represents the point above which there may be some community reaction to noise. If activity noises are to exceed this limit then the following is required:

- The proponent should apply all feasible and reasonable work practices to meet the noise affected level
- The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contract details.

This will be developed with the main contractor leading up to and during the construction phase.

5.3.2 Vibration

Ground-borne vibration is not considered an issue as the DECC guidance only specifies vibration limits for outside of working hours.

6 Summary

WSP Acoustics have been appointed to carry out a noise impact assessment for the North Eveleigh Affordable Housing Project located in Eveleigh, NSW.

This noise impact assessment is required as part of the Development Application for the proposed development.

The criteria have been established from the Director's General requirements.

6.1 Noise and vibration ingress

Noise levels on the proposed building's facades have been predicted based on traffic flow data and onsite measurements. Glazing specifications have been provided in section 4.2 to meet the criteria.

The proposed ventilation strategy noise ingress predictions meet the criteria.

Based on the worst case scenario the vibration results are well below the criteria.

6.2 Noise Emissions

Plant noise emissions are subject to the project specific noise levels from the Industrial Noise Policy criteria in Section 2.1.3 and will be achieved through equipment selections and placement.

6.3 Construction noise & vibration

Ground borne vibration is not considered an issue in accordance with guidance from the DECC.

Site activity noise is expected to be at or above the Noise Affected Management trigger of 54dBA and therefore, appropriate actions will be developed with the main contractor leading up to and during the construction phase.

The following is an outline assessment at this stage. A detailed assessment will need to be undertaken once the main contractor is appointed and additional detailed construction methods are known.

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