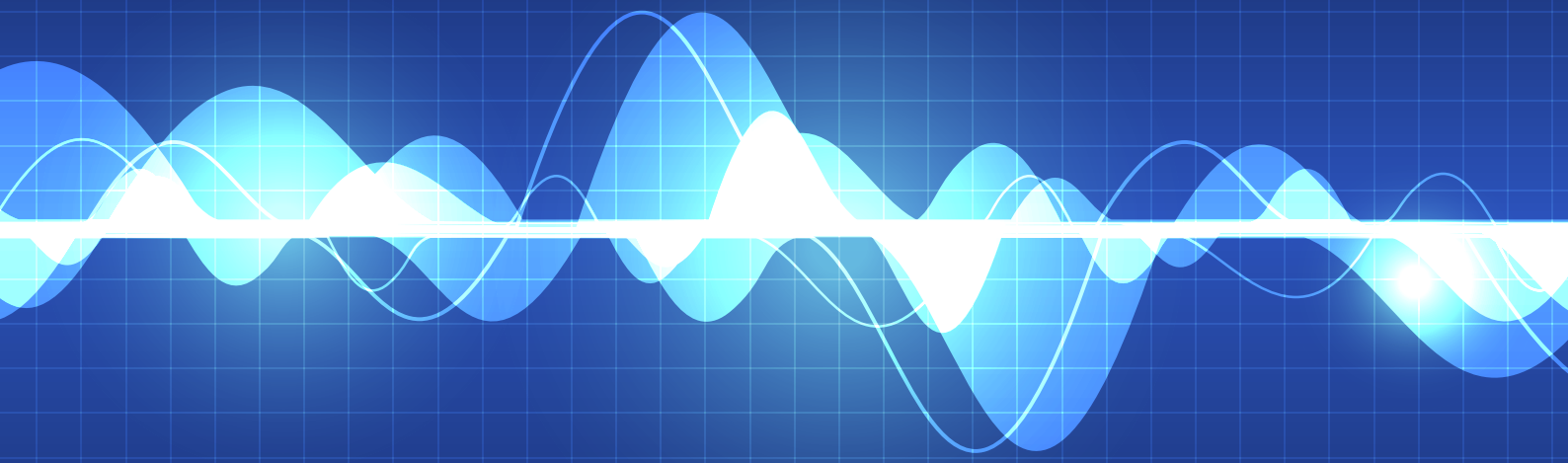
30-46 Auburn Road, Regents Park
Planning Changes

Noise and Vibration Desktop Screening Assessment

Prepared for City Plan Services
June 2021



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30-46 Auburn Road, Regents Park Planning Changes

Noise and Vibration Desktop Screening Assessment

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1 Introduction

EMM Consulting Pty Ltd have been engaged by City Plan Services to prepare an acoustic assessment for proposed planning changes at 30-46 Auburn Road, Regents Park NSW. Planning proposals for the site include increasing the Floor Space Ratio (FSR) and maximum building heights. The site is adjacent to the Southern Sydney Freight Line and the Sydney Trains network.

The purpose of the acoustic assessment is to provide a screening assessment to determine whether future development on the site would be capable of complying with relevant noise standards.

1.1 Site background

It is understood that an application was made by a developer in 2015 to increase the FSR of the site and to increase allowable building heights to 64 metres. However, this application was not accepted by Council, and instead recommended a lesser increase in the FSR and allowable building heights. Following submission to the Department of Planning, Industry and Environment (DPIE), and a Gateway determination, an amended Planning Proposal was recommended, including the following:

- Increase FSR from 0.6:1 to 2:1; and
- Increase height of buildings to 23 metres, 29 metres and 41 metres as shown below (extract from brief):

Buildings are proposed to be setback from the property boundaries by 4.5 metres, corresponding to a typical distance from nearby rail lines of approximately 22 metres.

2 Assessment requirements

2.1 State Environmental Planning Policy (Infrastructure) 2007

Clause 87 of the State Environmental Planning Policy (Infrastructure) 2007 (SEPP) applies to residential development on land adjacent to a rail corridor. The SEPP provides guidance on internal noise levels within residential development as presented below.

> **87 Impact of rail noise or vibration on non-rail development**
>
> (3) If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded—
>
> (a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10.00 pm and 7.00 am.
>
> (b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.

The interim guideline Development Near Rail Corridors and Busy Roads clarifies that these criteria are determined as an $L_{Aeq,9hr}$ for the night-time period (10 pm to 7 am) and an $L_{Aeq,15hr}$ for the day time period (7 am to 10 pm).

2.2 Development Near Rail Corridors and Busy Roads – Interim Guideline

To support the intent of the SEPP, DPIE released the interim guideline Development Near Rail Corridors and Busy Roads (the Guideline) in 2008. This provides additional guidance on assessment of ground-borne and airborne noise and vibration that has the potential to affect future residential development. Table 2.1 presents noise criteria provided by the Guideline for both road and rail for different forms of development.

Table 2.1 Noise criteria from Development Near Rail Corridors and Busy Roads 2008

Residential Buildings		
Type of occupancy	**Noise Level (in dB(A))**	**Applicable time period**
Sleeping areas (bedroom)	35	Night 10 pm to 7 am
Other habitable rooms (excluding garages, kitchens, bathrooms and hallways)	40	At any time
Non-Residential Buildings		
Type of occupancy		**Recommended Max Level**
Educational institutions including childcare centres		40
Places of Worship		40
Hospitals	Wards	35
	Other noise sensitive areas	45

Notes: Airborne noise is calculated as $L_{Aeq,9hr}$ for night-time and $L_{Aeq,15hr}$ for daytime. Ground-borne noise is calculated as 95th percentile of $L_{max,slow}$ from individual passbys.

Short term vibration levels from rail corridors are required to comply with the criteria outlined in the DECC publication *Asssessing Vibration: a technical guideline* 2006. Vibration criteria for intermittent vibration are provided in Table 2.2.

Table 2.2 Acceptable vibration dose values for intermittent vibration from Assessing Vibration: a technical guideline 2006

Location	Daytime		Night-time	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas	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

Notes: Daytime refers to the period between 7am and 10pm, and night-time refers to the period from 10pm to 7am.

3 Noise and vibration assessment

3.1 Airborne noise

3.1.1 Southern Sydney Freight Line

The Southern Sydney Freight Line is a dedicated freight line allowing for separation of passenger and freight services. At its nearest point, the Southern Sydney Freight Line (SSFL) is setback a distance of 40 metres from the site and line speed in this area is 70 km/hr.

The Australian Rail Track Corporation (ARTC) operates the SSFL and has published compliance monitoring reports following completion of construction. The most recent report is the 5 Year Compliance Monitoring Report, published by AECOM in May 2018 (AECOM reference 60560900-RPNV-01_C, dated 21 May 2018). As part of this compliance monitoring report, long-term measurements were taken just to the south of 30-46 Auburn Road at 35 Wellington Road, Birrong. The compliance monitoring location was approximately 36 metres from the SSFL, and as such, represents a conservative estimate of noise levels from the SSFL at 30-46 Auburn Road (40 m away).

Table 3.1 reproduces the reported measured noise levels from the SSFL 5 Year Compliance Monitoring Report at 35 Wellington Road, Birrong. These measured noise levels are based on measurements taken by AECOM between 7 and 18 February 2018.

Table 3.1 Measured operational noise levels from 5 Year Compliance Monitoring Report

Location	Ambient $L_{Aeq,24hr}$	All Trains $L_{Aeq,24hr}$	SSFL $L_{Aeq,24hr}$	SSFL L_{Amax}
35 Wellington Road, Birrong	60	54	49	80

Analysis of individual passby events recorded within the 5 Year Compliance Monitoring Report shows that most freight movements occur during the night-time period (ie between 10 pm and 7 am). Based on this and an analysis of average day and night movements, it is calculated that noise levels at a distance of approximately 36 metres from the SSFL are:

- $L_{Aeq,15hr}$ of 48 dB(A)
- $L_{Aeq,9hr}$ of 51 dB(A)

These values represent worst case noise levels from the South Sydney Freight Line based on present freight volumes at the development site.

3.1.2 Sydney Trains

The development site is located adjacent the Bankstown T3 line, with Sydney Trains travelling to Sefton, Regents Park and Birrong stations. Estimated train volumes have been obtained for these lines based on current Sydney Trains timetables. These train volumes are provided below in Table 3.2.

Table 3.2 Estimated Sydney Train volumes near development site

Travel Direction	Daytime – Up	Night-time – Up	Daytime – Down	Night-time – Down
Birrong to Sefton	37	13	34	13
Sefton to Regents Park	2	0	1	0
Birrong to Regents Park	58	13	57	12

Speed information for rail lines has been obtained from Sydney Trains Drivers Route Knowledge Diagrams for the Main South Line (Version 5.08, effective May 2021).

Noise modelling was undertaken using the Nordic Rail Prediction Method (Kilde Report 130, 1984), adapted to measurements of Sydney Trains presented within the Transport for NSW *Rail Noise Database Stage III Measurements and Analysis*. Adjustments to noise emission levels for track conditions were included where necessary as presented in Table 3.3.

Table 3.3 Track Condition Adjustments

Track Condition	Adjustment (dB)
Track Radius < 300 m	+8
Track Radius 300 to 500 metres	+3
Switch / turnout / crossing	+6

While these adjustments were applied, it is noted that where curve radii are small, there are some studies showing that curve squeal can lead to even more significant increases in maximum noise levels than the above values. Nearby track has a radius of approximately 200 metres, and this may lead to even higher levels of squeal than the +8 adjustment applied. It is recommended that a developer undertake noise measurements at this location in order to capture the potential impact of wheel squeal.

Measurements were predicted across the development site, with buildings representative of the proposed building height limits presented in Section 1.1.

3.1.3 Cumulative impact

The maximum cumulative external $L_{Aeq,9hr}$ from rail noise predicted on the development site was 57 dB(A). This level was predicted at ground floor of buildings located in locations identified by City Plan Services as representative of worst-case locations. Typically noise levels were reduced by approximately 1 to 2 dB(A) at higher storeys above the ground floor. The highest $L_{Aeq,15hr}$ predicted rail noise levels were 59 dB(A) at the same locations. Predicted noise levels for each building façade and floor are attached as Appendix A to this report.

Based on these predicted levels, upgraded constructions are recommended for bedrooms that may be constructed along the western edge of the property to achieve the internal noise limits under the SEPP noise criteria. These constructions are consistent with Treatment Category 1 from *Development near busy roads and rail corridors*, and are as follows:

- windows and sliding doors to be constructed from minimum 4 mm monolithic with standard weather seals;
- facade constructed with minimum R_W of 28, eg 6 mm thick fibre cement sheeting on 90 mm deep timber stud, lined internally with 13 mm thick plasterboard;

- pitched concrete, terracotta tile or metal sheet roof with sarking, 10 mm plasterboard ceiling and R 1.5 insulation batts installed in cavity; and
- any timber doors to be constructed from 35 mm solid core timber door fitted with full perimeter acoustic seals.

These treatments are not likely to be deemed onerous, and as such, management of airborne noise levels across the development site should be deemed feasible. For modern residential construction, many elements are likely to be above and beyond these requirements, (eg 6.38 mm thick laminated glass rather than 4 mm monolithic glass in order to comply with thermal requirements under the National Construction Code).

It should be noted that noise from the nearby track is likely to contain wheel squeal due to the relatively small curvature of track. While the predicted levels provided include wheel squeal, the specific level and nature of wheel squeal in this area may lead to a higher level of noise, and potentially annoyance. The presence of wheel squeal and the level of squeal should be confirmed by on site measurements and modelling; however, it is unlikely that mitigation measures would be considered onerous. It is recommended that the level of wheel squeal and appropriate noise mitigation measures be addressed in the finalisation of the planning proposal and at a Development Application stage by the Planning Proposal Authority, DPIE and the consent Authority.

3.2 Ground-borne noise

Given the relatively small setback distances, ground-borne noise would be a potential consideration for buildings on the western side of the development property. However, it is noted from track configuration drawings that speeds through this section of track are below 35 km/h. This would greatly reduce the potential for ground-borne noise. Should buildings be planned for the western side of the property, consideration of ground-borne noise may be beneficial. While it is unlikely that ground-borne noise is likely to be a significant concern given the low speeds of trains in this area, should ground-borne noise be identified as an issue after construction, this would be complex and significantly costly to rectify. As such, an assessment of ground-borne noise should be included by a developer proposing to construction buildings along the western edge of the proposed development site.

It is recommended that the level of ground-borne noise and appropriate mitigation measures be addressed in the finalisation of the planning proposal and at a Development Application stage by the Planning Proposal Authority, DPIE and the consent Authority.

In order to reduce the impact of potential ground-borne noise, the following mitigation measures may be considered:

- Increasing the mass of building foundations, which can lead to larger coupling loss as vibration transfers from ground into buildings; and
- Using heavier building elements to increase the mass of the building.

3.3 Ground-borne vibration

Figure 3.1 is an excerpt from the Guideline, presenting the distances from rail lines at which a rail vibration assessment is recommended.

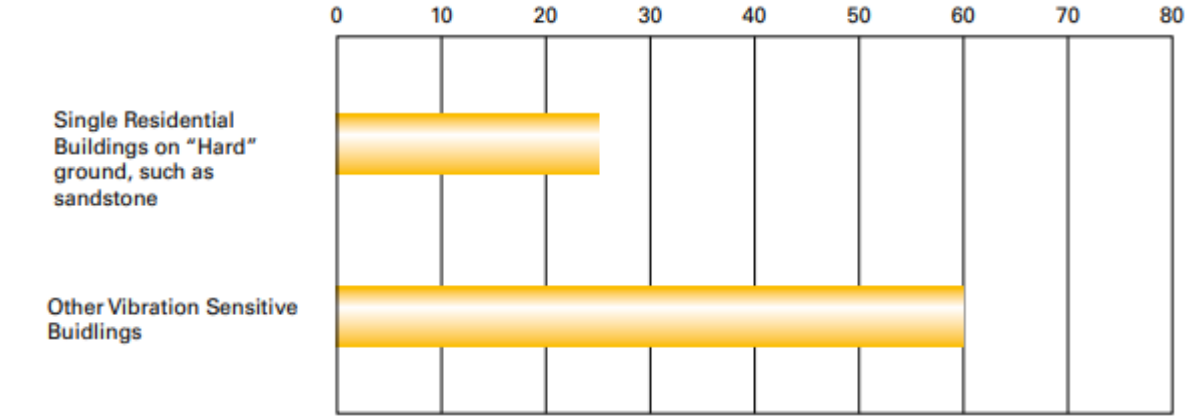

Figure 3.2: Distance from the nearest operational track (m)

Figure 3.1 Recommended distances at which a vibration assessment is required from rail operations (excerpt from Development near Rail Corridors and Busy Roads – Interim Guideline, 2008)

As some buildings may be constructed within 22 metres of the nearest operational track, the Guideline would typically recommend a vibration assessment be completed.

To determine vibration dose values in accordance with Assessing Vibration, measurements of rail vibration levels on the site would typically be required. This is due to vibration levels being strongly influenced by local conditions, including geological features, track conditions, vehicle and rail maintenance levels and speeds.

In the absence of detailed vibration measurements, the US Federal Transit Authority (FTA) Transit Noise and Vibration Impact Assessment Manual (dated September 2018) was used. This manual is commonly used across the world for assessment of ground-borne vibration impacts from rail infrastructure, and provides a reasonable screening approach to provide an indication of whether vibration impacts may be present.

Assessing Vibration identifies the US Federal Transit Authority (FTA) Transit Noise and Vibration Impact Assessment Manual (dated September 2018) as an appropriate methodology for the assessment of ground-borne vibration impacts from rail developments, although notes that any results should be verified by on site measurements. The FTA manual recommends ground-borne vibration limit of 72 VdB (re 1 micro-inch/sec) for individual rail passbys for residential properties.

Figure 3.2 presents RMS velocity vibration curves for various transit systems at standard speeds and varying distance. Adjustments have been made to these curves in accordance with those presented in Table 3.4

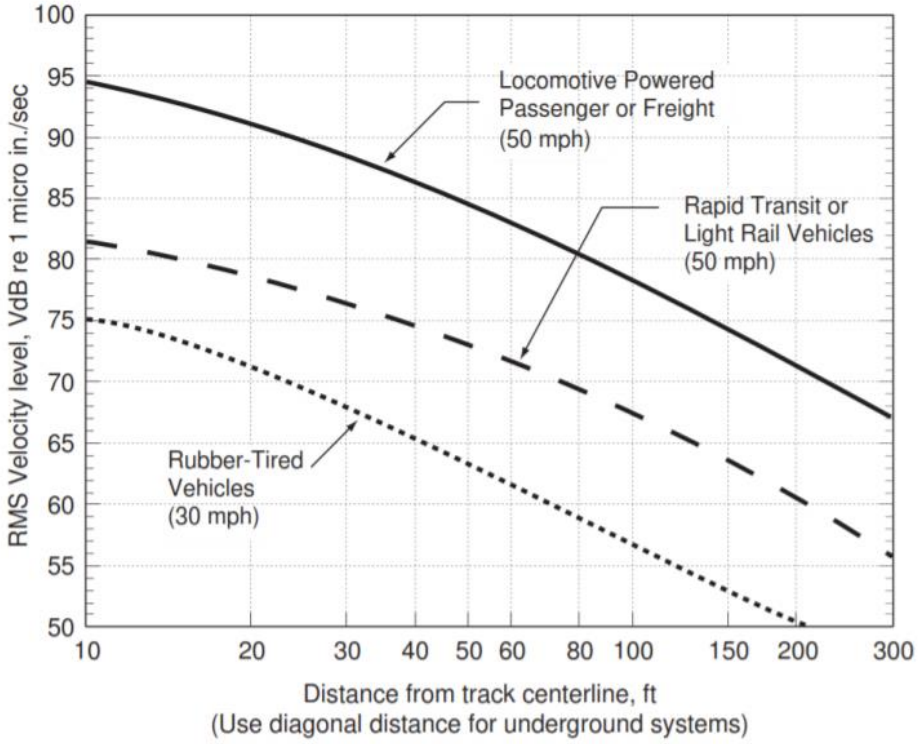

Figure 3.2 **RMS vibration levels for various transit systems (reproduced from FTA Transit Noise and Vibration Impact Assessment Manual, September 2018)**

Table 3.4 **Relevant adjustments applied to ground-borne vibration assessment in accordance with FTA Transit Noise and Vibration Impact Assessment Manual**

Factor	Adjustment	Comment
Speed	-7 dB	Vibration level is approximately proportion to $20\log(v/v_{ref})$. Therefore a -7 dB adjustment has been made due to speeds from nearby rail of approximately 35 km/h.
Worn wheels or wheels with flats or worn / corrugated track	+10 dB	Worn wheels and track can lead to higher vibration levels. As maintenance of the rail corridor and rail vehicles would be beyond the developer's capabilities, this correction has been applied.
Special trackwork	+5 dB	An adjustment of +5 dB is recommended at distances of 30 to 60 metres from special trackwork. The southern edge of the development site is located within this distance of switches and crossovers.
Coupling to building foundation	-10 dB	An adjustment of -10 dB is typical for coupling to multi-storey buildings (3 storeys and up) with masonry construction.
Geologic conditions that promote efficient propagation of vibration in soil	Between 0 to +10 dB	Specific ground conditions are unknown and may lead to increased vibration levels.

Based on the above adjustments and assessment methodology from the FTA manual, ground-borne vibration is unlikely to present an issue; however, it is recommended that vibration measurements occur to confirm specific ground conditions. Should geologic conditions that promote efficient propagation of vibration be present, vibration may be of concern within up to 75 metres of the rail line (dependent on the level of maintenance of track and rail vehicles). These measurements should also include specific measurements along the southern edge of the property, where additional vibration impacts may be present due to the presence of special trackwork.

Similar to ground-borne noise, ground-borne vibration is likely to be significantly difficult to rectify if issues are not detected until after construction of residential properties.

It is recommended that the level of ground-borne vibration and appropriate vibration mitigation measures be addressed in the finalisation of the planning proposal and at a Development Application stage by the Planning Proposal Authority, DPIE and the consent Authority.

4 Conclusion and recommendations

A noise and vibration review of impacts from rail operations on a proposed residential development at 30-46 Auburn Road, Regents Park has been conducted. The proposed site is located near the T3 Bankstown line and the South Sydney Freight Line. Rail speeds and track configurations have been sourced from route information.

Based on the information available, a minimal level of noise mitigation would be required for buildings that may be located on the western side of the redeveloped lot. The level of airborne noise mitigation is not likely to be considered onerous by a developer, and as such, it is considered reasonable and feasible to achieve internal noise criteria.

Due to the tight curve radii on the nearby track between Birrong and Regents Park station, there is potential for a significant degree of wheel squeal. As wheel squeal can be more annoying than other forms of train noise due to higher frequency sounds, a higher degree of noise mitigation may be proposed by a developer to reduce the risk of annoyance from future residents.

As speeds on the nearby rail tracks are relatively low, ground-borne noise is considered to be a low risk. However, as it is difficult to rectify ground-borne noise issues following construction and assessment of ground-borne noise is recommended for residential development along the western edge of the property.

While ground-borne vibration is also likely to present a low risk, there is the potential that localised soil conditions may be present that lead to increased vibration levels. Additionally, there is uncertainty about the condition of the track near the proposed lot, and the curvature of the rail line in this area is likely to lead to higher levels of wear on rail vehicle wheels and rails. This higher level of wear may translate to higher levels of vibration in close proximity to these curves. As for ground-borne noise, it is recommended that a vibration assessment is conducted for development along the southern and western edges of the property.

Appendix A

Predicted rail noise levels

Table A.1 Predicted rail noise levels in dB(A)

Building	Floor	Façade direction	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$
Building A/B	GF	E	46	42
	F 1	E	46	42
	F 2	E	46	42
	F 3	E	46	42
	F 4	E	46	42
	F 5	E	46	42
	F 6	E	46	42
	F 7	E	46	42
	F 8	E	46	42
	F 9	E	46	41
	F 10	E	46	41
	F 11	E	45	41
	F 12	E	43	38
	GF	N	54	50
	F 1	N	54	50
	F 2	N	54	50
	F 3	N	54	50
	F 4	N	54	49
	F 5	N	54	49
	F 6	N	54	49
	F 7	N	54	49
	F 8	N	53	49
	F 9	N	53	49
	F 10	N	53	49
	F 11	N	53	49
	F 12	N	53	49
	GF	S	53	49
	F 1	S	53	49
	F 2	S	53	48
	F 3	S	53	48
	F 4	S	52	48
	F 5	S	52	48
	F 6	S	52	48
	F 7	S	52	48

Table A.1 Predicted rail noise levels in dB(A)

Building	Floor	Façade direction	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$
	F 8	S	52	48
	F 9	S	52	48
	F 10	S	52	48
	F 11	S	52	48
	F 12	S	51	47
	GF	W	59	55
	F 1	W	59	55
	F 2	W	59	55
	F 3	W	59	55
	F 4	W	59	55
	F 5	W	59	54
	F 6	W	58	54
	F 7	W	58	54
	F 8	W	58	54
	F 9	W	58	53
	F 10	W	57	53
	F 11	W	57	53
	F 12	W	57	53
Building C/D	GF	E	46	42
	F 1	E	46	42
	F 2	E	46	42
	F 3	E	46	42
	F 4	E	46	42
	F 5	E	46	42
	F 6	E	46	42
	F 7	E	46	42
	F 8	E	46	42
	GF	N	52	48
	F 1	N	52	48
	F 2	N	52	48
	F 3	N	52	48
	F 4	N	52	48
	F 5	N	52	48
	F 6	N	52	48

Table A.1 Predicted rail noise levels in dB(A)

Building	Floor	Façade direction	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$
	F 7	N	52	48
	F 8	N	52	47
	GF	S	55	50
	F 1	S	55	50
	F 2	S	55	50
	F 3	S	54	50
	F 4	S	54	50
	F 5	S	54	50
	F 6	S	54	50
	F 7	S	54	50
	F 8	S	54	50
	GF	W	59	54
	F 1	W	59	54
	F 2	W	59	54
	F 3	W	58	54
	F 4	W	58	54
	F 5	W	58	54
	F 6	W	58	54
	F 7	W	58	53
	F 8	W	57	53
Building E/F	GF	E	50	46
	F 1	E	50	46
	F 2	E	50	46
	F 3	E	50	46
	F 4	E	50	46
	F 5	E	50	46
	F 6	E	50	46
	F 7	E	50	46
	F 8	E	49	45
	GF	N	49	45
	F 1	N	49	45
	F 2	N	49	45
	F 3	N	49	45
	F 4	N	49	45

Table A.1 Predicted rail noise levels in dB(A)

Building	Floor	Façade direction	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$
	F 5	N	49	45
	F 6	N	49	45
	F 7	N	49	45
	F 8	N	49	45
	GF	S	58	54
	F 1	S	58	54
	F 2	S	58	54
	F 3	S	58	54
	F 4	S	58	54
	F 5	S	58	54
	F 6	S	57	53
	F 7	S	57	53
	F 8	S	57	53
	GF	W	59	55
	F 1	W	59	54
	F 2	W	59	54
	F 3	W	58	54
	F 4	W	58	54
	F 5	W	58	54
	F 6	W	58	54
	F 7	W	58	54
	F 8	W	58	54
Building G	GF	E	41	37
	F 1	E	41	37
	F 2	E	41	37
	F 3	E	41	37
	F 4	E	41	37
	F 5	E	41	37
	F 6	E	41	37
	GF	N	45	41
	F 1	N	45	41
	F 2	N	45	41
	F 3	N	45	41
	F 4	N	45	41

Table A.1 Predicted rail noise levels in dB(A)

Building	Floor	Façade direction	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$
	F 5	N	45	41
	F 6	N	46	41
	GF	S	46	42
	F 1	S	46	42
	F 2	S	46	42
	F 3	S	46	42
	F 4	S	46	42
	F 5	S	46	42
	F 6	S	46	42
	GF	W	50	45
	F 1	W	50	45
	F 2	W	50	45
	F 3	W	50	45
	F 4	W	50	45
	F 5	W	49	45
	F 6	W	49	45
Building I	GF	E	45	42
	F 1	E	45	42
	F 2	E	45	42
	F 3	E	45	42
	F 4	E	45	42
	F 5	E	45	42
	F 6	E	45	42
	GF	N	48	44
	F 1	N	48	44
	F 2	N	48	44
	F 3	N	48	44
	F 4	N	48	44
	F 5	N	48	44
	F 6	N	48	44
	GF	S	55	51
	F 1	S	55	51
	F 2	S	55	51
	F 3	S	54	51

Table A.1 Predicted rail noise levels in dB(A)

Building	Floor	Façade direction	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$
	F 4	S	54	50
	F 5	S	54	50
	F 6	S	54	50
	GF	W	50	45
	F 1	W	50	45
	F 2	W	50	45
	F 3	W	50	45
	F 4	W	50	45
	F 5	W	50	45
	F 6	W	50	45

A.1 Predicted cumulative rail noise levels from SSFL and Sydney Trains

For comparative purposes, according to the Southern Sydney Freight Line (SSFL) 5 Year Compliance Report, existing residences exposed to the SSFL in Carramar, Canley Vale, Sefton and Birrong are typically exposed to ambient noise levels between 53 to 60 dB $L_{Aeq,24hr}$. Predicted façade levels at the development at 30-46 Auburn Road, Regents Park are consistent with, or below these noise levels.