2 KARINGAL DRIVE PIMPAMA

Noise Assessment for Buildings in a Transport Noise Corridor

For

BJS GETS RICHER PTY LTD

DOC. REF: Q573-01-P ACOUSTIC REPORT (R0)
6 APRIL 2021

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Project	2 Karingal Drive Pimpama
Subject	Noise Assessment for Buildings in a Transport Noise Corridor (MP 4.4)
Client	BJS Gets Richer Pty Ltd
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1 Introduction

Enfield Acoustics has been engaged by BJS Gets Richer Pty Ltd to assess the noise impacts affecting the proposed 71-townhouse development at *2 Karingal Drive Pimpama* (herein referred to as Subject Land) in accordance with the *Gold Coast City Council Regional Infrastructure overlay code* and by extension the *Queensland Development Code Mandatory Part 4.4.* This assessment will form part of the Development Application to the council.

To this end, Enfield Acoustics has:

1. Conducted unattended noise logging on the Subject Land for 6 days
2. Analysed the results and assessed against the relevant performance criteria prescribed under GCCC Regional infrastructure overlay
3. Provided recommended construction requirements to satisfy the Noise Categories under MP 4.4

Documents referred to in this report and relied on are as follows:

1. Pre-lodgement meeting minutes Ref PLO/2020/90 dated 1st June 2020 received 23rd March 2021
2. Plans prepared by Brian Johnston Plan Design P/L received 2nd February 2021

2 Policy Requirements

2.1 Pre-lodgement Meeting Minutes

The pre-lodgement meeting (PLM) minutes provide reference to *PO7 of the City Plan 'Regional infrastructure overlay code'* (Gold Coast City Council code 8.2.14) as well as several additional items as requirements for the Acoustic Report as follows:

Acoustic report required – rail noise

PO7 of the City Plan *'Regional infrastructure overlay code'* requires that the proposed development mitigates noise intrusion to provide acceptable levels of amenity for occupants of the development. An acoustic report is requested to be submitted to address the potential noise impacts from rail noise on the proposed development. The report must:

a. Provide background sound level monitoring;
b. Detail the expected impact of rail noise against Table 8.2.14-3 of the *'Regional infrastructure overlay code'*;
c. Be conducted in accordance with *AS1055.1-3 - Acoustics – Description and Measurement of Environmental Noise* and the *Environmental Protection Act 1994* and subordinate regulations and policies;
d. Provide all monitoring data and locations, methodology and calculations; and
e. Detail the required control measures to achieve compliance with the applicable legislation and standards.

Note – The acoustic report will be required to demonstrate that the development is designed and constructed to reduce transport noise and compliant with *'Queensland Development Code MP4.4 – Building in a Transport Noise Corridor'*.

Whilst the Performance Outcome PO7 does not specify a noise criteria, the PLM minutes make reference to the Acceptable Outcome AO7 and Table 8.2.14-3 therein. Given rail noise is the dominant source and the development is not adjacent to a State Controlled Road, this assessment will use the *rail noise* targets provided by Table 8.2.14-3 which are shown below:

Measurement Location	Design Level Noise Criteria
1m in front of the most exposed part of a proposed sensitive land use	**For rail noise** a) 65 dB (A), assessed as the 24-hour average equivalent continuous A-weighted sound pressure level; b) 87 dB (A), assessed as a single event maximum sound pressure level.
Inside bedrooms, living areas and noise-sensitive areas of non-residential uses (e.g. classrooms)	**For rail noise** Average L_{max} (10pm to 6am) not greater than 50 dB (A).
External formal living area	**For rail noise** $L_{Aeq\ (1hr)}$ (6am to 10pm) not greater than 55 dB (A).

Table 1 Noise Criteria under Regional infrastructure overlay code

The term *External formal living area* is interpreted as *private outdoor space* which is described as the outdoor living areas of each townhouse dwelling.

2.2 Mandatory Part 4.4

The PLM also makes reference to the *Queensland Development Code Mandatory Part 4.4* (MP 4.4) policy which provides building envelope requirements to ensure Habitable rooms in residential buildings located in a transport noise corridor are adequately protected from transport noise to safeguard occupants' health and amenity. To this end, the policy outlines a process to determine the Noise Category by either:

a) State or Local Government records, as identified in a gazettal notice following designation of a transport noise corridor; or
b) a noise assessment prepared by a suitably qualified person.

For reference, here is *Schedule 3, Table 1 – Noise Category Levels from MP 4.4*:

Noise Category	Level of *transport noise* * ($L_{A10,\ 18hr}$) for *State-controlled roads* and designated local government roads	Single event maximum noise* (L_{Amax}) for *railway land*
Category 4	≥ 73 dB(A)	≥ 85 dB(A)
Category 3	68 - 72 dB(A)	80 – 84 dB(A)
Category 2	63 – 67 dB(A)	75 – 79 dB(A)
Category 1	58 - 62 dB(A)	70 - 74 dB(A)
Category 0	≤ 57 dB(A)	≤ 69 dB(A)

* measured at 1 m from the façade of the proposed or existing building.

Table 2 – Noise Category Levels from MP 4.4

The State Planning Policy Interactive Mapping website (https://spp.dsdip.esriaustraliaonline.com.au/geoviewer/map/planmaking) indicates that the Subject Land development falls predominantly within **Category 3 and 4** for rail noise and no exposure to a State-controlled Road. As part of this assessment, we confirmed the Noise Category on the basis of a site specific noise assessment. The diagram below shows the Subject Land and the Transport Noise Corridor – Railway noise categories.

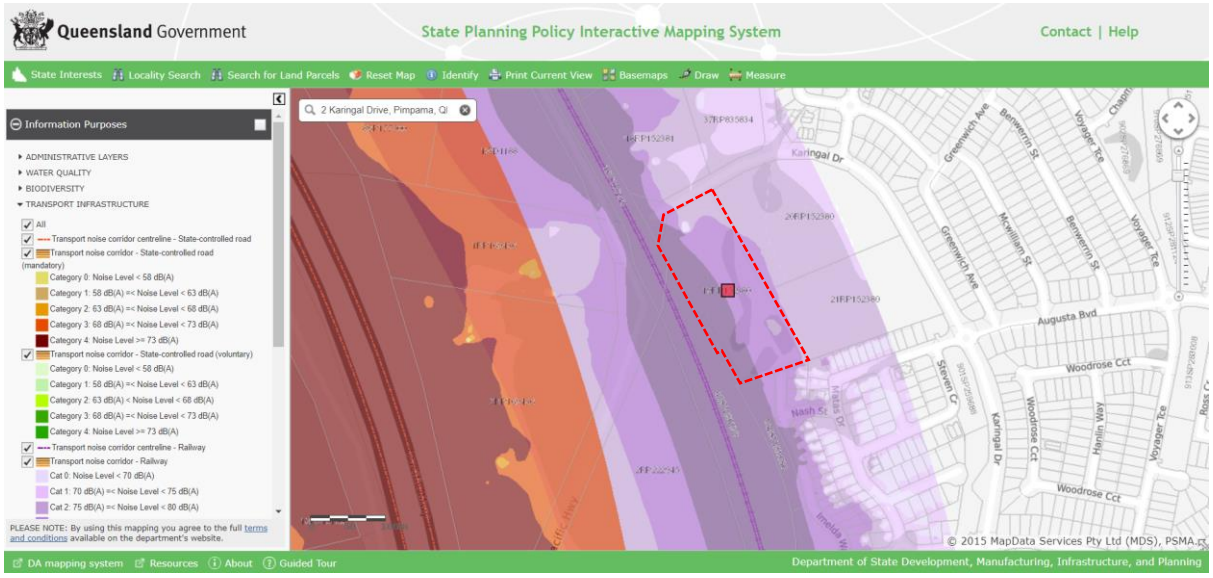


Figure 1: Transport Noise Corridor - Noise Category from SPP Interactive Mapping System

2.3 Assessment Criteria

To summarise, the following assessment criteria for rail noise have been used in this report.

Assessment Location	Policy	Measurement	Criteria
1m from proposed façade	MP 4.4	$L_{Amax\ SEM}$	As per Noise Category
1m from most exposed facade	BCC 8.2.14	$L_{Aeq\ 24hr}$	65dB(A)
	BCC 8.2.14	$L_{Amax\ SEM}$	87dB(A)
Inside bedrooms and living areas	BCC 8.2.14	Average L_{max}	Not greater than 50dB(A), 10pm to 6am
External formal living area	BCC 8.2.14	$L_{Aeq\ (1hr)}$	55dB(A), 6am to 10pm

Table 3 Assessment Criteria

3 Proposed Development

The proposed development consists of 71 townhouse residences located on the Subject Land. It is noted that the PLM took place when the design consisted of 73 townhouses, however since then the development has reduced in scope to 71 townhouses. There is a creek which runs through the centre of the lot. Adjacent to the Subject Land is another residential development currently under construction (at time of writing this report) which includes a 2m (approximate) noise wall erected on the property boundary adjoining the rail corridor. We understand the adjacent

development is a residential subdivision. A satellite image/diagram is provided below for reference.

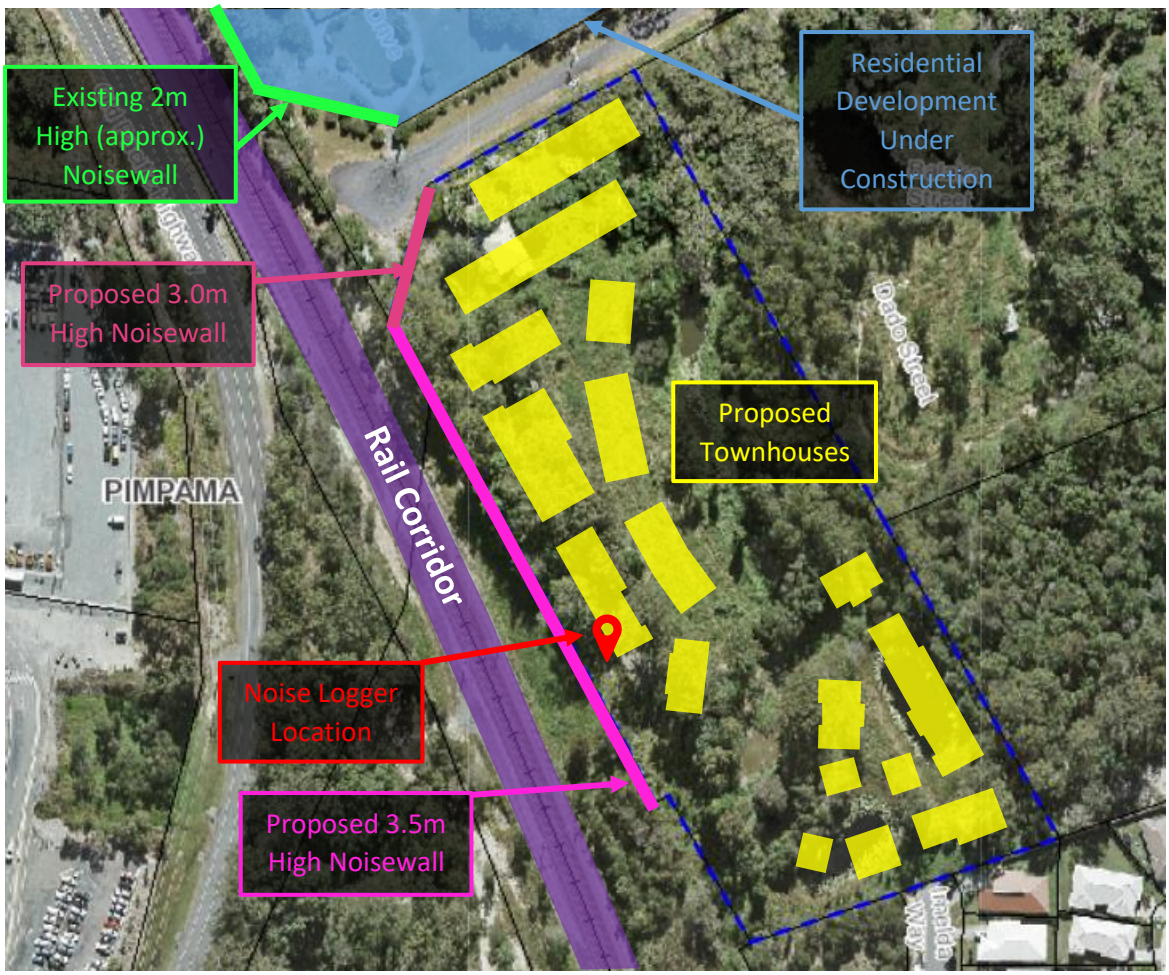


Figure 2 Proposed Development on Subject Land

There are a mix of two-storey and three-storey residential townhouses proposed. It is noted that the effectiveness of a noise wall is reduced for the proposed dwelling upper floors. For clarity we have identified the 3 storey residences on the following diagram.

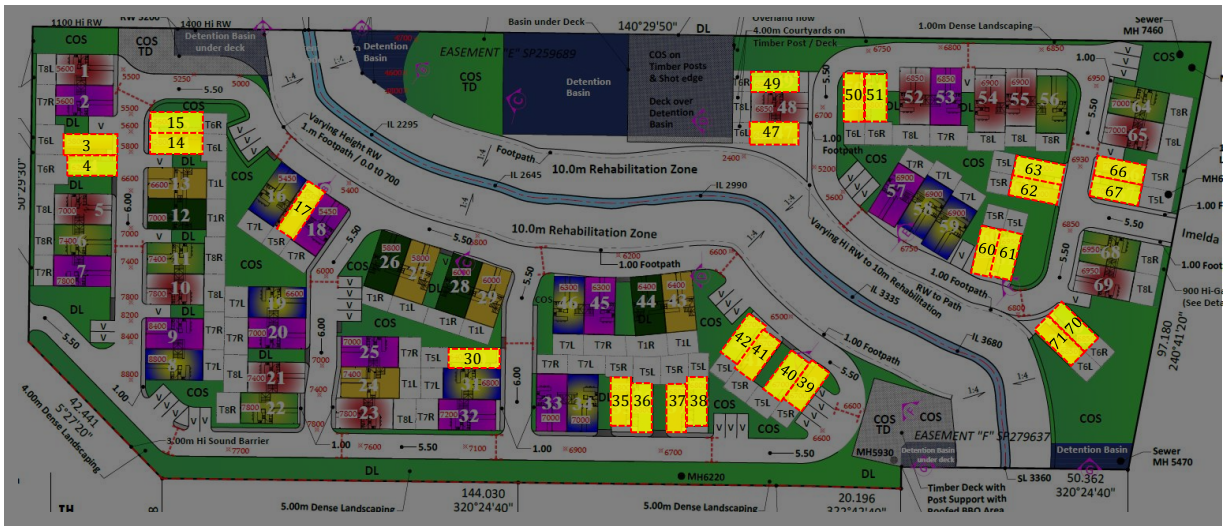


Figure 3 Proposed Development with 3 storey dwellings

4 Measurement and Analysis

4.1 Noise

We conducted on site noise measurements for a total of 6 days, beginning 12th March 2021 and ending 18th March 2021. The noise survey equipment used was a Type-1 integrating noise logger, installed on the Subject Land in freefield (no existing built form on the site). The equipment was calibrated at the commencement and completion of the noise monitoring with no significant drift recorded.



Figure 3: Photograph of noise logger installed on subject land

The noise logging device was placed at at a location representing 1m from the closet façade of the proposed development to the rail corridor. The noise logging device was installed at approximately 1.5m height from the natural surface of the ground. 1-second interval samples were recorded which were processed into 15-minute logging intervals provided in this report. We reviewed *Weather Underground* data for the period and have ignored the data for the days with adverse weather conditions. All measurements were carried out in accordance with *AS1055.1-3 - Acoustics – Description and Measurement of Environmental Noise.*

4.2 Single Event Maximum

Both the GCCC 8.2.14 and MP 4.4 policies refer to the calculation of a Single Event Maximum (SEM) when assessing rail noise. Both policies refer to *Queensland Rail Limited's Code of Practice: Railway Noise Management (2007) Version 2*. This document mentions SEM however does not provide reference to how it is to be calculated. We have instead used the *Queensland Department of Transport and Main Roads* document titled *Interim Guideline – Operational Railway Noise and Vibration* (listed under Volume 3: Operational railway noise and vibration) which describes SEM with the following:

e) The Single Event Maximum (SEM) from trains should be calculated based on one of the following options (which should be clearly explained in the assessment report):

   - *If the number of single events due to train passing is greater than or equal to 15 over a given 24 hour period, the SEM is the arithmetic average of maximum levels of the highest 15 events.*
   - *If the number of single events due to train passing is less than 15 over a given 24 hour period, the SEM is the arithmetic average of maximum levels of all the events.*

f) Across all the days of monitoring, the highest SEM level shall be reported and assessed as determined in accordance with (e) above. For example, over a two day / 48 hour period, there will be two SEM levels. The highest dB(A) value of these two SEM levels is to be reported and assessed.

We reviewed the train timetables for nearby stations Ormeau and Coomera. During the noise logging period there were a maximum of 96 trains passing by each 24 hour period. Therefore in accordance with the above guideline, an arithmetic average of the maximum levels of the highest 15 events was calculated.

The L_{max} SEM was measured to be 84dB(A) at the monitoring position.

From the monitoring data, it is noted that the following L_{max} SEM to L_{eq} relationships have been established for this site:

- $L_{max} - L_{eq,24hr} = 28$
- $L_{max} - L_{eq,1hr} = 20$

Rail traffic in terms of number of passby events is, in our experience, generally consistent over time. Commuter capacity is generally managed by adding carriages rather than adding more trains. In any case, a conservative increase in passby events of 10% over 10 years would increase the noise levels by less than 0.5dB(A) L_{Aeq} (with no impact on L_{Amax}). Such an increase would be considered immaterial for the Subject Development.

4.3 Results

We used the site measurements as well as site layout plans and topography as inputs to prepare a 3D noise propagation model to predict noise levels at each townhouse. The model was calibrated using the monitoring position and data. For brevity we have grouped the townhouses into clusters based on the proposed construction schedule. The model also included the proposed 3m-3.5m noise wall as noted on plans. The following table demonstrates the worst-case levels at proposed facades fronting the rail corridor, which are predicted to be compliant with the targets, noting that levels will be less than shown below for dwellings which are setback, or have facades facing away from the rail corridor.

	External Noise Criteria Targets					
	L_{Amax} SEM		$L_{Aeq\ 24hr}$		$L_{Aeq\ 1hr}$ 6am-10pm	
Level	Result	Target	Result	Target	Result	Target
Ground	81.5	87	53.5	65	61.5	55
Level 1	81.5	87	53.5	65	61.5	55
Level 2	86.5	87	58.5	65	-	-

Table 4 Worst-Case External Noise Results (Façade Corrected)

We note that there are no private outdoor areas proposed to Level 2 townhouses so the $L_{Aeq,1hr}$ results are not relevant here. It is also noted that because the above Table only summarises worst-case results across the Subject Land, including areas where there is no noise wall proposed, the results are generally consistent. Refer to Table 5 for a more detailed Table of results for each townhouse block.

The table below shows the predicted L_{Amax} Single Event Maximum and the corresponding Rail Noise Category from MP 4.4.

	Ground Floor		Level 1		Level 2	
Townhouse	$L_{Amax\ SEM}$	Category	$L_{Amax\ SEM}$	Category	$L_{Amax\ SEM}$	Category
1-7	78.5	2	79.5	3	76.5	2
8-15	75.5	1	80.5	3	76.5	2
16-18	68.5	0	68.5	0	74.5	1
19-22	76.5	2	81.5	3	-	-
23-25	75.5	2	81.5	3	-	-
26-29	70.5	1	70.5	1	-	-
30-32	75.5	2	81.5	3	80.5	2
33-38	76.5	2	81.5	3	86.5	4
39-42	74.5	1	79.5	2	-	-
43-46	71.5	1	72.5	1	-	-
47-49	73.5	1	73.5	1	73.5	1
50-56	70.5	1	70.5	1	73.5	1
57-59	77.5	2	77.5	2	-	-
60-61	77.5	2	77.5	2	77.5	2
62-63	73.5	1	73.5	1	73.5	1
64-69	76.5	2	77.5	2	74.5	1
70-71	81.5	3	81.5	3	81.5	3

Table 5 Predicted Rail Noise Levels and Noise Categories (Façade Corrected)

5 Recommendations

5.1 MP 4.4 Compliance

The Noise Category under MP 4.4 provides minimum R_w for various elements of the building envelope required to achieve adequate internal acoustic amenity.

Category	Glazing		External Walls	Roof	Floors	Entry Doors
Category 4	43		52	45	51	35
Category 3	38_1	35_2	47	41	45	33
Category 2	35_1	32_2	41	38	45	33
Category 1	27_1	24_2	35	35	-	28
Category 0	No additional acoustic treatment required – standard building assessment provisions apply					

Table 6 Minimum R_w required for each component of building envelope

1. where total area of glazing for a habitable room is greater than 1.8m2
2. where total area of glazing for a habitable room is less than or equal to 1.8m2

The following recommended construction methods will ensure compliance with MP 4.4 Noise Categories as noted in Table 3.

Category	Component of Building Envelope	Recommended Construction Method(s)
Category 4	Glazing	10.38 laminated glass / 24mm air gap / 8.5mm Vlam Acoustic seals to all operable windows
	External Walls	Proposed cladding over: -Two layers of 9mm cement sheet -Framing with bulk insulation infill -Two layers of 13mm plasterboard
	Roof	-Roof cladding (tile or corrugated steel) -Framing with bulk insulation infill (100mm minimum) -One layer of 13mm sound rated plasterboard or two layers of 10mm standard plasterboard
	Floors	N/A where slab on-grade
	Entry Doors	Solid core timber not less than 45mm thick with acoustic seals to perimeter and automatic seal to threshold
Category 3	Glazing	6.5 Vlam / 6mm air gap / 6.5mm Vlam Acoustic seals to all operable windows
	External Walls	Proposed cladding over: -One layer of 9mm cement sheet -Framing with bulk insulation infill -Two layers of 13mm plasterboard
	Roof	-Roof cladding (tile or corrugated steel) -Framing with bulk insulation infill (50mm minimum) -One layer of 10mm standard plasterboard

	Floors	N/A where slab on-grade
	Entry Doors	Solid core timber not less than 45mm thick with acoustic seals to perimeter and automatic seal to threshold
Category 2	Glazing	Minimum 10.38mm single glazing (or 6/12/6 DGU) Acoustic seals to all operable windows
	External Walls	Proposed cladding over: -One layer of 9mm cement sheet -Framing with bulk insulation infill -One layer of 13mm plasterboard
	Roof	-Roof cladding (tile or corrugated steel) -Framing with bulk insulation infill (50mm minimum) -One layer of 10mm standard plasterboard
	Floors	N/A where slab on-grade
	Entry Doors	Solid core timber not less than 45mm thick with acoustic seals to perimeter and automatic seal to threshold
Category 1	Glazing	Minimum 4mm single glazing (or any DGU) Acoustic seals to all operable windows
	External Walls	Proposed cladding over: -One layer of 6mm cement sheet -Framing with bulk insulation infill -One layer of 13mm plasterboard
	Roof	-Roof cladding (tile or corrugated steel) -Framing -One layer of 10mm standard plasterboard
	Floors	N/A where slab on-grade
	Entry Doors	Solid core timber door, no acoustic seals required

Table 7 Recommended Construction Methods

5.2 GCCC 8.2.14 Compliance

5.2.1 $L_{Aeq\ 24hr}$, external

The $L_{Aeq\ 24hr}$ noise levels comply with the 8.2.14 overlay code requirements.

No further acoustic recommendations are necessary.

5.2.2 L_{Amax}, external

The L_{Amax} external noise levels comply with the 8.2.14 overlay code requirements.

No further acoustic recommendations are necessary.

5.2.3 L_{Amax}, internal

The L_{Amax} internal noise levels intrinsically comply with the 8.2.14 overlay code requirements where the recommendations under MP 4.4 are implemented. By way of example:

1. The highest L_{Amax} reported is 86.5dB(A) which is Category 4 construction
2. Compliance with Category 4 construction provides a minimum Transport Noise Reduction of 40dB(A) in accordance with MP 4.4
3. A resultant level of 46.5dB(A) or less meets the requirement of 50dB(A) under the GCCC code.

No further acoustic recommendations are necessary where MP 4.4 is implemented.

5.2.4 $L_{Aeq\ 1hr}$, external

The $L_{Aeq,1hr}$ external noise levels will exceed the GCCC code requirements at a number of Ground and Level 1 external formal living areas, as follows:

- Townhouses 5-7 ground level
- Townhouses 5-7 L1 balconies
- Townhouses 8-10 L1 balconies
- Townhouse 22-23 L1 balconies
- Townhouses 32-42 L1 balconies
- Townhouses 57-60 L1 balconies
- Townhouses 69-71 L1 balconies
- Townhouses 69-71 ground level

We note again that the exact interpretation of 'External Formal Living Area' is not provided in the scheme so it is questionable that the above applies.

Where GCCC determine that the above does apply, we recommend the following to comply with the code:

- 1.8m high acoustic fencing is installed around the ground level external areas of the highlighted townhouses below.
- Balconies to the following L1 dwellings are configured to face away from the rail corridor for the highlighted townhouses below.

Refer to the below markup of the development plans.

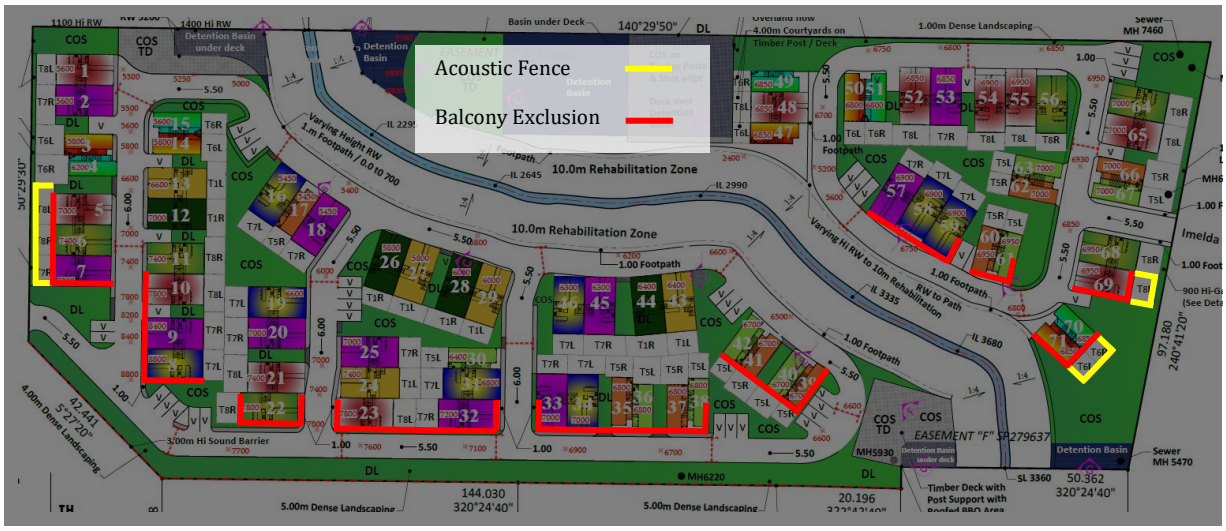


Figure 3 Proposed Development acoustic fence and balcony exclusion locations

Refer to Appendix A for $L_{eq,1hr}$ noise modelling contours.

6 Summary

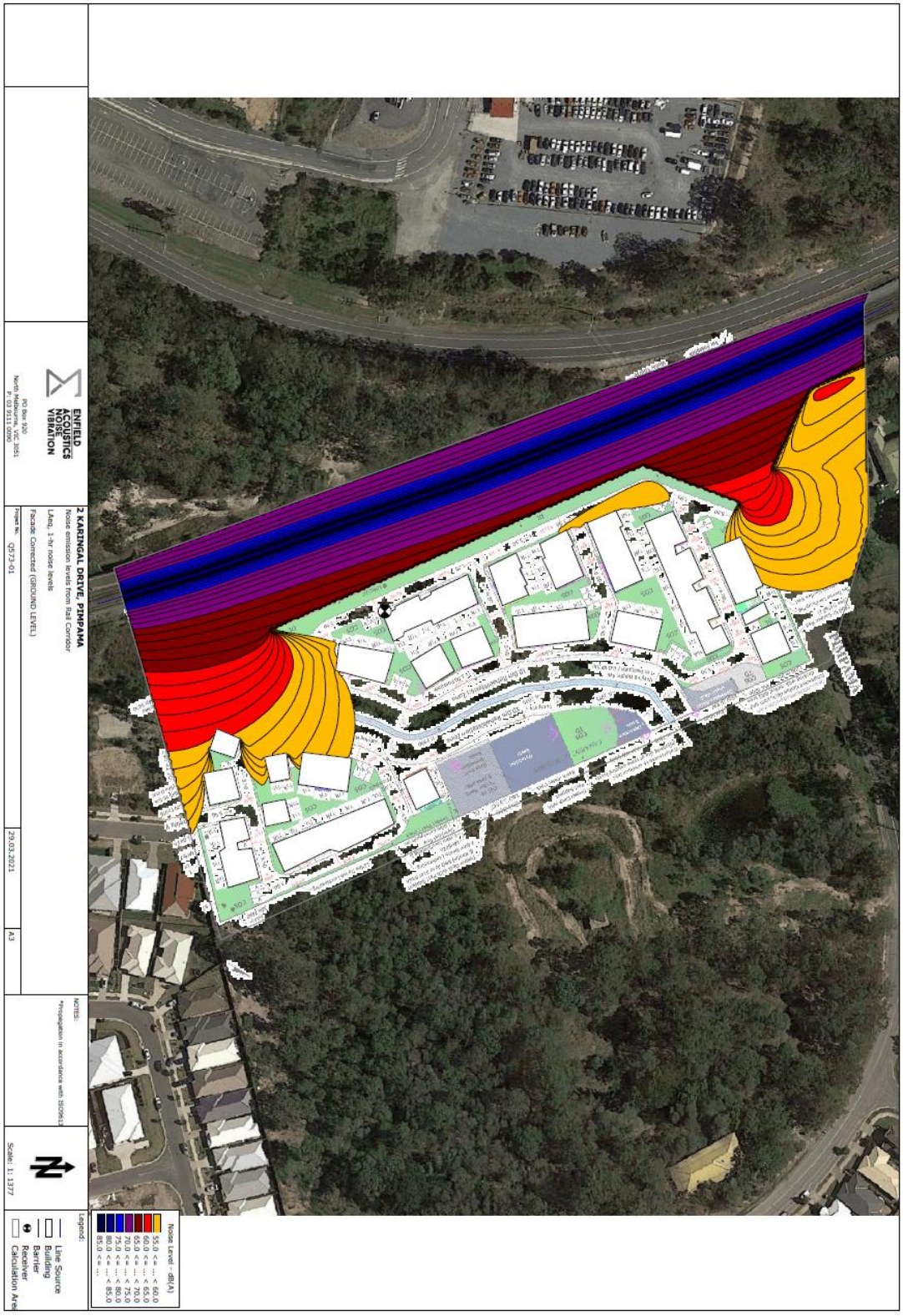
Enfield Acoustics was engaged to provide an acoustic report to support a forthcoming Development Application for the Subject Land. Our assessment employed site measurements and noise propagation modelling to provide recommendations to ensure compliance with the following relevant noise policies:

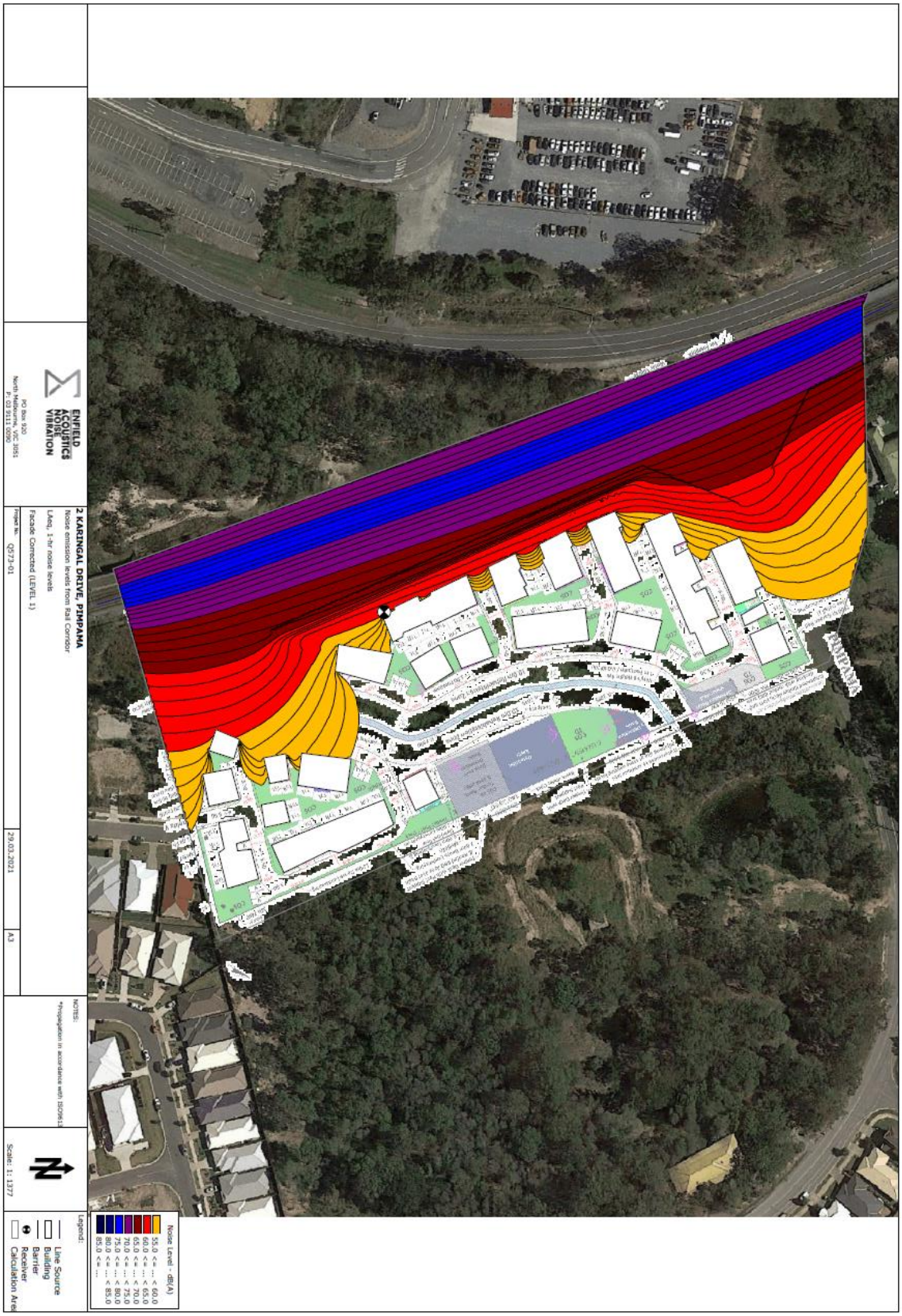
- Construction methods have been provided to ensure internal amenity targets of MP 4.4 policy.
- The addition of acoustic fencing locations, as well exclusion zones for balcony placements, provide compliance with GCCC 8.2.14 policy.

On the basis of the Applicant following the recommendations in this report, the forthcoming application should be approved by Council.

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Appendix A – Noise Modelling Contours




ENFIELD ACOUSTICS NOISE VIBRATION
2 KARINGAL DRIVE, PIMPAMA
Noise emission levels from Rail Corridor
LAeq, 1-hr noise levels
Façade Corrected (LEVEL 1)
Project No.
Q573-01
29.03.2021
A3
NOTES:
Scale: 1: 1377
Legend:
Noise Level - dB(A)
55.0 A≤ ... A< 60.0
60.0 A≤ ... A< 65.0
65.0 A≤ ... A< 70.0
70.0 A≤ ... A< 75.0
75.0 A≤ ... A< 80.0
80.0 A≤ ... A< 85.0
85.0 A≤ ...
Line Source
Building
Barrier
Receiver
Calculation Area

Appendix B – L_{90} Noise Data

