

**PLANS AND DOCUMENTS**  
referred to in the PDA APPROVAL

**28 JAN 2016**

**MEDQ**



## Document Control Page

---

**NOISE MEASUREMENT SERVICES PTY LTD**

18 Lade Street, Enoggera QLD 4051  
 PO Box 2127  
 Brookside Centre, QLD 4053

Telephone: (7) 3355 9707  
 Facsimile: (7) 3355 7210  
 E-mail: [info@noisemeasurement.com.au](mailto:info@noisemeasurement.com.au)

---

Copy No \_\_\_\_\_

Revision No	Issue Date	Revision Description	Author	Review
0	18/11/2015	Draft Report for Consideration	MD	GR, MT

Copy No(s)	Rev No	Destination
1 pdf	0	Rise Projects
2	0	Noise Measurement Services
3 pdf	0	Mode Design

**REPORT FOR**            Rise Projects  
**CONTACT**             Katarina Hayston

Signed



**Max Thorne**  
 (Director)

**DISCLAIMER**

This Report by Noise Measurement Services Pty Ltd is prepared for a particular Client and is based on the agreed objective, scope, conditions and limitations as may be stated in the Executive summary. The Report presents only the information that Noise Measurement Services Pty Ltd believes, in its professional opinion, is relevant and necessary to describe the issues involved. The Report should not be used for anything other than the intended purpose and should not be reproduced, presented or reviewed except in full. The intellectual property of this Report remains with Noise Measurement Services Pty Ltd. The Client is authorised, upon payment to Noise Measurement Services Pty Ltd of the agreed Report preparation fee, to provide this Report in full to any third party.

## Contents

Executive Summary .....	4
Conclusions.....	4
Recommendations.....	4
1. Introduction .....	5
2. Measurement of Ambient Noise Levels .....	9
2.1 Measurement Procedures.....	9
3. Noise Criteria and Limits.....	12
3.1 BCC – City Plan.....	12
3.2 BCC – Residential Design – Multiple Dwelling Code.....	12
3.3 QDC MP4.4 – Road and Rail Traffic Noise .....	15
3.4 Air Conditioning - Noise Emissions .....	16
3.5 Environmental Protection (Noise) Policy 2008.....	16
3.6 State Development Assessment Provisions – Module 1 Community Noise.....	16
3.7 Railway Noise .....	16
4. Noise Impact Assessment .....	17
4.1 Brisbane City Council – Multiple Dwelling Code .....	17
4.1.1 Car Parking and Vehicle Movements.....	17
4.1.2 Air- Conditioners.....	17
4.2 QDC MP4.4 .....	17
Appendix A: Plans .....	28
Appendix B: Traffic Noise Calculations.....	32
Appendix C: Building Construction – QDC MP4.4 .....	46
Appendix D: Statement of Qualifications .....	54
Appendix E: Glossary.....	55

## Executive Summary

---

This Report is in response to a request from Rise Project for a noise impact assessment report on a proposed residential development at 63 and 65 Abbotsford Road, and 1 and 3 Folkestone Street, Bowen Hills (lots 1 and 2 on RP50667; lots 3 and 4 on RP10094). The development is adjacent to Abbotsford Road, which is a designated *Transport Noise Corridor* under the Brisbane City Council (BCC) Cityplan 2014. It is also partly within the *Transport Noise Corridor* for the state controlled railway to the west. The development is therefore subject to design requirements under the Queensland Development Code Mandatory Part 4.4. The default noise categories for the site are Category 2 at ground level for rail noise; Categories 2 and 3 for road traffic noise.

The site is in a Priority Development Area (PDA), administered by Economic Development Queensland (EDQ) (see **plate 5**). It is understood that EDQ will employ relevant Council and State for assessment of a development in a PDA. The noise level criteria applicable to this development are contained in:

- Brisbane City Council – City Plan 2014
- Brisbane City Council - Multiple Dwelling Code
- Queensland Development Code Mandatory Part 4.4 – Buildings in a Transport Noise Corridor

In addition the following are considered:

- Department of Environment and Heritage Protection – Environmental Protection Act 1994 (EPA 94)
- Department of Infrastructure, Local Government and Planning – Module 1

## Conclusions

---

It is concluded that-

- The development is subject to significant levels of road traffic noise from Abbotsford Road. Units overlooking Abbotsford Road are exposed to high levels of noise, and are forecast at QDC MP4.4 Categories 3 and 4. Other unit façades and townhouses will be screened from road traffic noise, and are predicted to fall within Categories 0, 1 and 2. Predictions by façade are presented in **Section 4**.
- There is presently no practical means of determining the impact of rail noise, and the default Category 2 is accepted. As the dominant noise source is closer to the development than the railway line, it is considered that designing to road traffic noise (with higher Categories than the default for rail) will provide more protection than required by default.

## Recommendations

---

It is recommended that-

- The development be undertaken to achieve not less than the design considerations and acoustic treatments as outlined in **Section 4** of this Report.

# 1. Introduction

This Report is in response to a request from Rise Project for a noise impact assessment report on a proposed residential development at 63 and 65 Abbotsford Road, and 1 and 3 Folkestone Street, Bowen Hills (lots 1 and 2 on RP50667; lots 3 and 4 on RP10094). The development is adjacent to Abbotsford Road, which is a designated *Transport Noise Corridor* under the Brisbane City Council (BCC) Cityplan 2014. It is also partly within the *Transport Noise Corridor* for the state controlled railway to the west. The development is therefore subject to design requirements under the Queensland Development Code Mandatory Part 4.4. The default noise categories for the site are Category 2 at ground level for rail noise; Categories 2 and 3 for road traffic noise.

The site is in a Priority Development Area (PDA), administered by Economic Development Queensland (EDQ) (see **plate 5**). It is understood that EDQ will employ relevant Council and State for assessment of a development in a PDA. The noise level criteria applicable to this development are contained in:

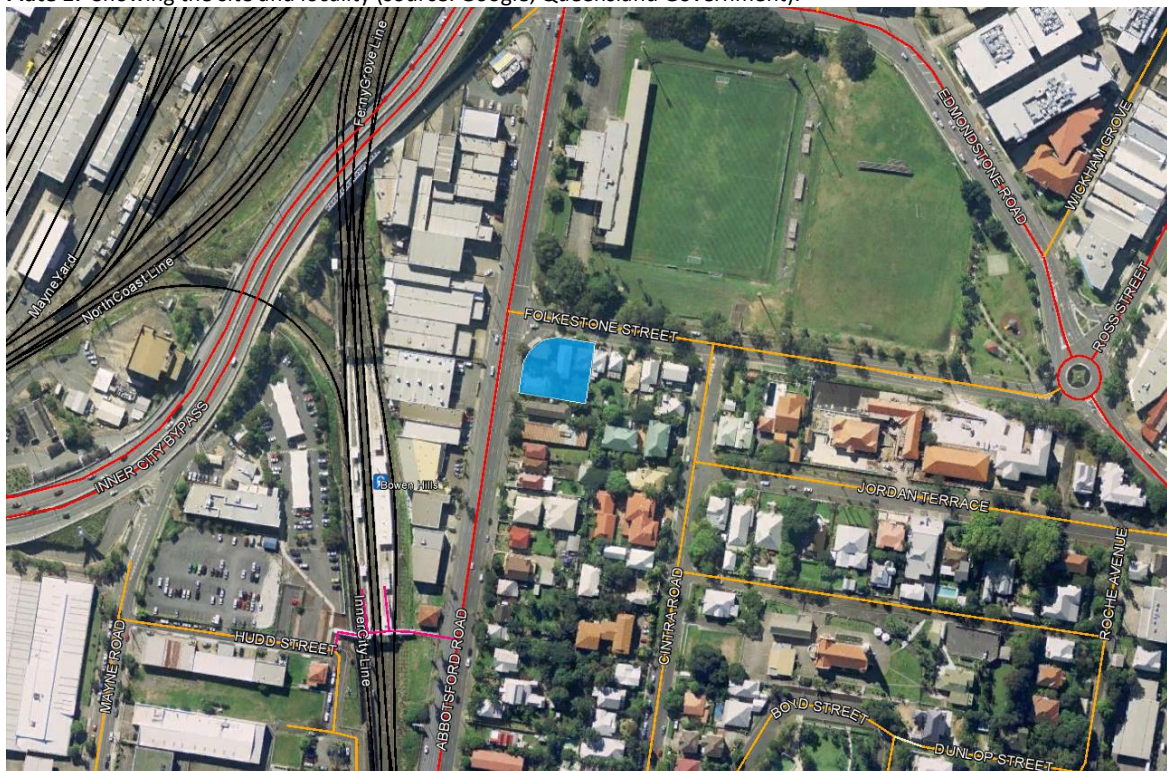
- Brisbane City Council – City Plan 2014
- Brisbane City Council - Multiple Dwelling Code
- Queensland Development Code Mandatory Part 4.4 – Buildings in a Transport Noise Corridor

In addition the following are considered:

- Department of Environment and Heritage Protection – Environmental Protection Act 1994 (EPA 94)
- Department of Infrastructure, Local Government and Planning – Module 1

The locality and development design is presented in the following **plates** and **photographs**. Plans are set out in **Appendix A**. Terms and definitions used in this Report are found in **Appendix E**.

**Plate 1:** Showing the site and locality (source: Google; Queensland Government).





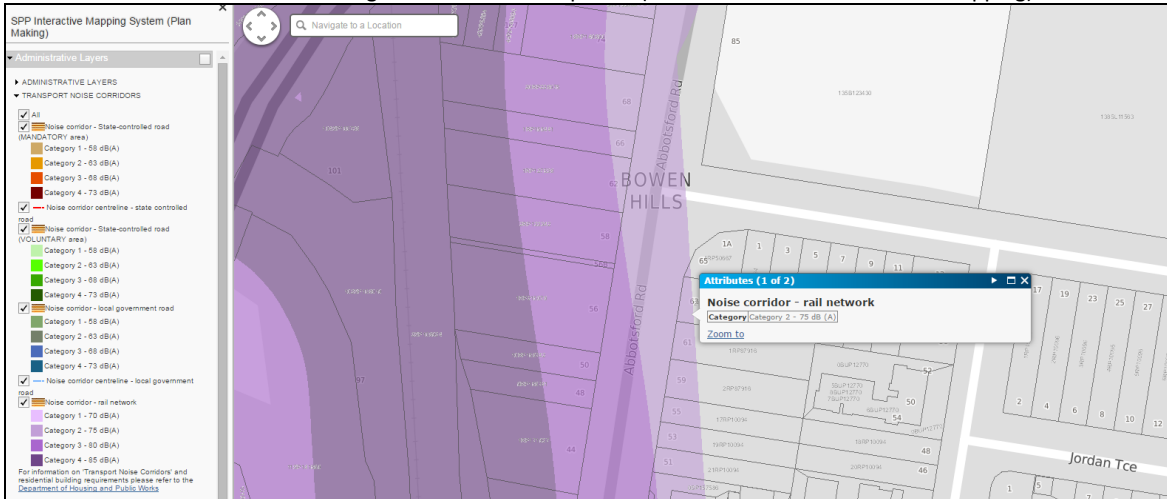
**Plate 2:** Showing the site plan for the development (source: Google, Queensland Government, Rise Projects).



**Plate 3:** Default road traffic Noise Categories for the Development (Source: Brisbane City Council)



**Plate 4: Default rail traffic Noise Categories for the Development (Source: DILGP SPP interactive mapping)**



**Plate 5: State Interest Zoning. The site is within a Priority Development Area (Source: Economic Development Queensland)**

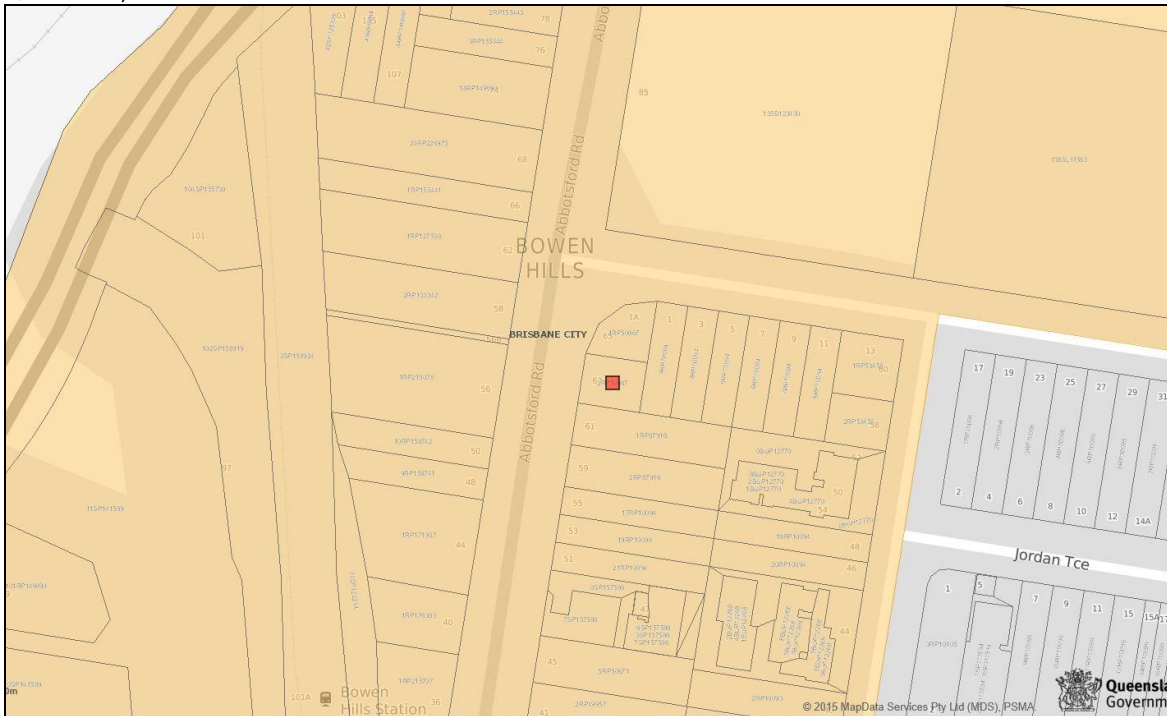


Plate 6: Council Zoning. The site is within an emerging community zone (Source: Brisbane City Council)



Photo 1: Showing current view of the site, 63 and 65 Abbotsford Road (Source: Google)



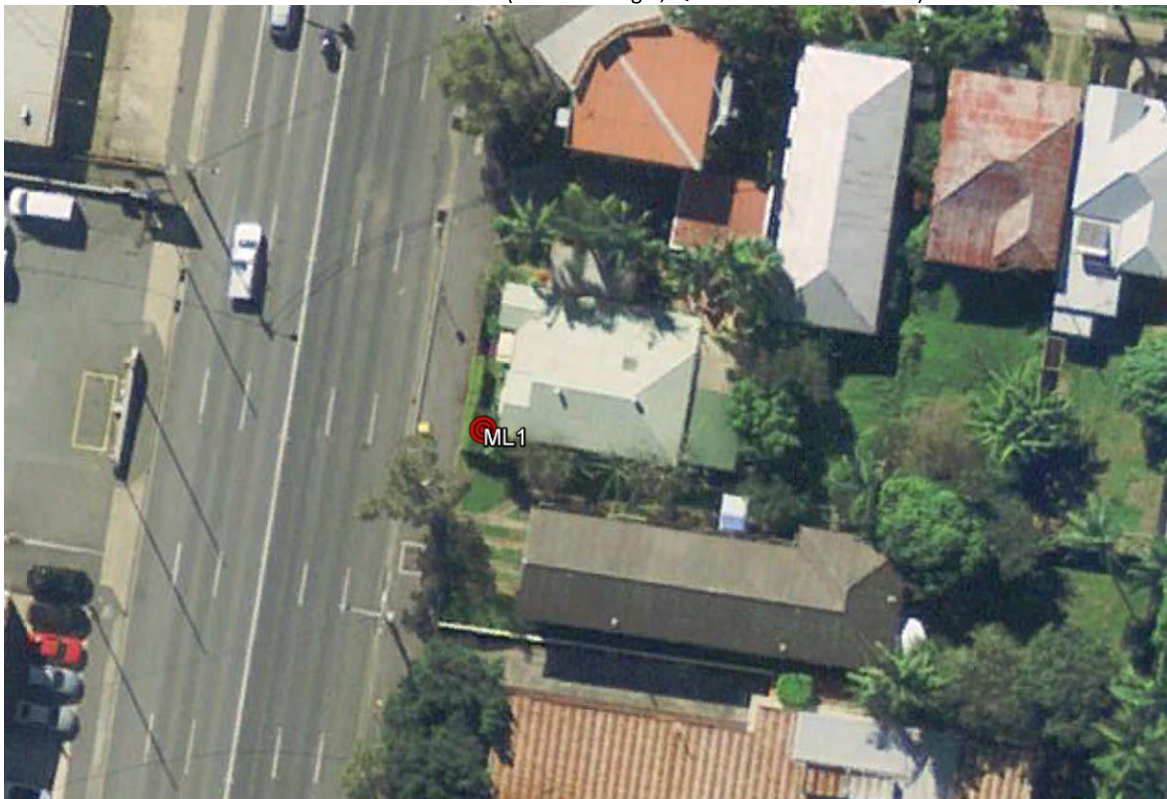


## 2. Measurement of Ambient Noise Levels

### 2.1 Measurement Procedures

In order to assess the potential impact of noise from all sources of noise in the locale, an ambient noise survey was conducted on-site. The noise logger was located at 63 Abbotsford Road, 1m from the western boundary fence, and 1.5m from the southern boundary fence at a height of 1.4m. The measurement location is identified as ML1 in this Report, and is presented in the following **plate** and **photos**. The location was 1m from the existing building and is considered façade-affected.

**Plate 6:** The measurement location ML1 is marked (source: Google; Queensland Government).



**Photo 2:** Showing measurement location ML1 (Source: NMS)



The noise loggers were field calibrated before and after each measurement session and was found to be within 0.2 dB(A) of the reference signal. All instrumentation used in this assessment hold a current calibration certificate from a certified NATA calibration laboratory. The following instruments were used to measure the ambient noise levels-

- Rion NL-22 type 2 environmental noise logger
- Larson Davis 831 type 1 environmental noise logger
- Quest CA-22 calibrator

Ambient sound pressure levels were measured generally in accordance with Australian Standard AS1055.1:1997 - 'Acoustics-Description and measurement of environmental noise - Part 1: General procedures'. Ambient noise levels were recorded at 15 minute intervals from the 11<sup>th</sup> – 13<sup>th</sup> of November 2015, and data from Thursday 12<sup>th</sup> November (representing a "typical" day) is presented in tabular form. The data is presented in **Figure 1** and **Table 1** below.

**Table 1:** Average ambient noise levels at ML1 on Thursday 13<sup>th</sup> November 2015 (levels in dB(A), façade-affected).

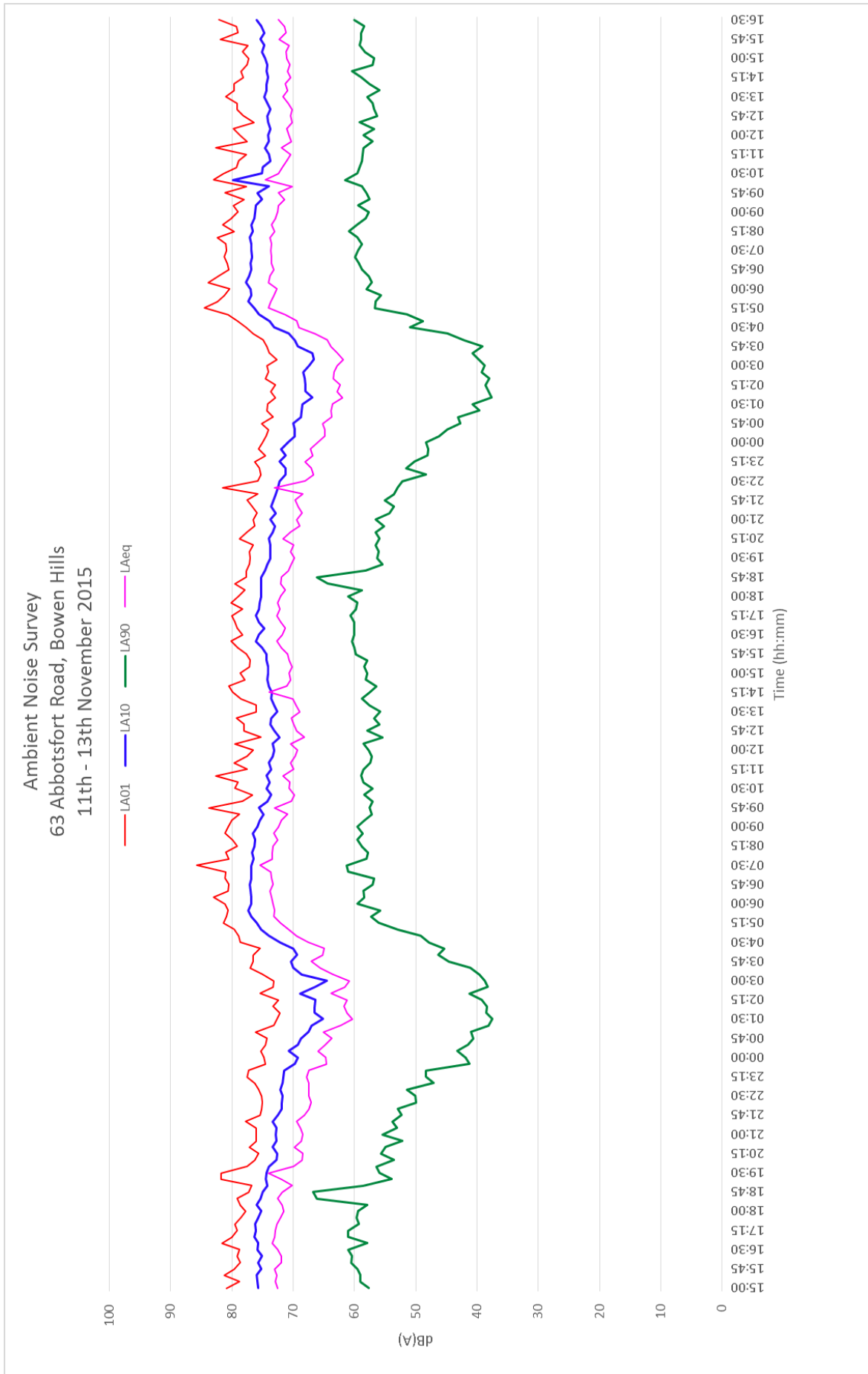
Time	LA(01)	LA(10)	LA(90)	LAeq
Day 6am to 6pm	81.2	74.9	58.4	71.9
Evening 6pm to 10pm	78.9	74.1	57.5	70.6
Night 10pm to 6am	79.6	70.3	45.1	67.3
Day max 1-hr				74.1
Night max 1-hr (night to 6am)				72.4
CoRTN 6am to 12pm		74.4	57.3	
24 hour	81.0			70.6

The table above includes measured levels from all sources of noise including road traffic, residential and other local sources of noise. Road traffic noise from Abbotsford Road was observed to be the dominant noise source, and the data presented in **Table 1** and **Figure 1** is considered to be consistent with an acoustic environment controlled by road traffic noise. As a conservative assumption, the measured  $L_{10, 18hr}$  from all sources is considered representative of road traffic noise, and has been used to calibrate the road traffic noise model presented in **Appendix B**.

Noise from railway traffic along the Ferny Grove line was not audible during an on-site survey, as the acoustic environment was dominated by road traffic noise. In an attempt to identify and measure railway noise, the Larson Davis 831 was configured to record audio event 'snapshots', with a trigger level set at 67 dB(A). However, road traffic noise dominated the measured events, and no railway passes were identified from the audio recordings. It is noted that the buildings opposite Abbotsford road completely screen the railway line from ML1, and it is concluded that railway noise at ML1 was not practically measurable due to significantly higher levels of road traffic noise. Nothing could be heard from the industrial precinct across Abbotsford Road to the west.

The measured  $L_{10, 18hr}$  at ML1 was 74.4 dB(A), façade-affected. This puts the location into **QDC Category 4**.





**Figure 1:** Measured ambient noise levels at Location ML1, 11<sup>th</sup> – 13<sup>th</sup> November 2015 (levels in dB(A), façade-affected)

### 3. Noise Criteria and Limits

#### 3.1 BCC – City Plan

Under the BCC City Plan 2014, Abbotsford Road has been designed as a Transport Noise Corridor, and the development site is within Noise Categories 2 and 3 of the Abbotsford Road overlay presented on the Brisbane City Council website (see **plate 3**). As a multiple dwelling within an Emerging Community Zone, it is understood that the development is assessable against the Transport Noise Corridor Overlay Code, as set out in Table 5.10.23 of the City Plan, and reproduced in **Table 2** below. Investigations show that the site is not under an *Industrial Amenity* Overlay, despite being in the vicinity of an industrial precinct. No industrial noise was observed during surveys, and it is considered that construction that achieves the design requirements for road traffic noise will also mitigate industrial noise.

**Table 2:** Brisbane City Plan 2014, Table 5.10.23 – Levels of assessment for Transport noise corridor overlay

Development	Level of assessment	Assessment criteria
<b>All aspects of developments</b>		
MCU, ROL, building work or operational work if prescribed exempt development	<b>Exempt</b>	Not applicable
MCU, ROL, building work or operational work if self-assessable development	<b>No change</b>	Not applicable
<b>MCU</b>		
MCU for a dual occupancy, multiple dwelling, residential care facility, retirement facility or rooming accommodation where accommodating 6 or more people, involving a new premises or an existing premises with an increase in gross floor area	<b>No change</b>	Transport noise corridor overlay code

It is concluded that there are mandated design requirements for mitigation of noise emissions from Abbotsford Road. Predictions of road traffic noise are set out in Section 4. The QDC MP4.4 is considered in **Section 3.3**.

#### 3.2 BCC – Residential Design – Multiple Dwelling Code

The Brisbane City Council (BCC) *City Plan 2014 Multiple Dwelling Code* provides performance requirements and acceptable solutions for noise issues when assessing a material change of use and/or building work for a multiple dwelling not within a centre zone category or mixed use zone. As discussed in **Section 3.1** BCC has designated traffic noise corridors around certain Council roads, and the QDC MP4.4 methodology applies to acoustic assessment that may be required within these corridors. The QDC MP4.4 is considered in **Section 3.3**.



**Table 3:** Performance criteria and acceptable solutions from City Plan 2014 Section 9.3.14.3 Multiple Dwelling Code

Performance Criteria	Acceptable Outcome
<p><b>PO21</b></p> <p>Development..... provides car parking that minimises impacts on the quality of adjoining streetscapes or public spaces and the <i>amenity</i> of adjoining residents in terms of location, bulk, form and amenity impacts including noise, odour or light having regard to:</p> <p>(a) The proximity of <i>dwelling houses</i> or existing multiple dwellings on adjoining sites;</p> <p>(c) <i>setback</i> distances to mitigate impacts;</p>	<p><b>AO21.1</b></p> <p>Development..... provides car parking that is:</p> <p>(a) Located below ground;</p> <p>(b) Located at ground level or above ground only if:</p> <p>(i) Contained within the <i>development footprint</i> and located behind the main building line, except where visitor parking.</p> <p>(c) Set back from front, rear and side boundaries in accordance with a neighbourhood plan or if no neighbourhood plan applies or no requirements are specified in a neighbourhood plan, <i>Table 9.3.14.3.E</i></p> <p>(d) Screened and landscaped</p>
<p><b>PO23</b></p> <p>Development ..... provides vehicle access and parking that must not impact on the <i>amenity</i> and privacy of residents within or adjoining the site.</p>	<p><b>AO23.1</b></p> <p>Development ... ensures that a hardstand or manoeuvring area situated at <i>ground level</i> is:</p> <p>(a) Located to minimise noise disturbance;</p> <p>(b) Screened to:</p> <p>(i) Minimise the reflection of car headlights onto dwelling windows;</p> <p>(ii) Attenuate noise;</p> <p>(c) Separated from habitable windows to minimize noise and fumes disturbance;</p>
	<p><b>AO23.2</b></p> <p>Development .....</p> <p>(a) Ensures any vehicle movement or vehicle parking areas along the side or rear boundary are acoustically screened from adjoining dwellings; or</p> <p>(b) Provides a vegetated buffer next to any movement or parking areas of 1m wide along the side boundary and 2m wide along the rear boundary</p>

Performance Criteria	Acceptable Solutions
<p><b>PO34</b></p> <p>Development provides front fencing and retaining walls that must:</p> <ul style="list-style-type: none"> <li>(a) Facilitate casual surveillance of the street and public space;</li> <li>(b) Enable use of private open space;</li> <li>(c) Assist in highlighting entrances to the property;</li> <li>(d) Provide a positive interface to the streetscape</li> </ul>	<p><b>AO34.1</b></p> <p>Development ensures that, where fencing is provided, the height of any new fence located on any common boundary to a street or public space is a maximum of:</p> <ul style="list-style-type: none"> <li>(a) 1.2m, where fence construction is solid or less than 50% transparent;</li> <li>(b) 1.5m where fence construction is at least 50% transparent;</li> <li>(c) 1.8m and solid only where the site is on an arterial road.</li> </ul>
<p><b>PO37</b></p> <p>Development must provide good neighbour fencing to adjoining properties.</p>	<p><b>AO37</b></p> <p>Development with side and rear boundary fencing that is required to achieve or protect privacy or amenity, is:</p> <ul style="list-style-type: none"> <li>(a) A minimum of 1.8m in height;</li> <li>(b) A maximum of 1.2m in height where fence construction is solid or less than 50% transparent, or 1.5m where fence construction is at least 50% transparent, forward of the main building line to the front boundary except where it has a noise mitigation function.</li> </ul>
<p><b>PO42</b></p> <p>Development that includes mechanical plant (including air-conditioning plant, heat pumps and swimming pool pumps) ensures it is located, designed and attenuated to achieve the following criteria:</p> <ul style="list-style-type: none"> <li>• <math>L_{Aeq,adj,T}</math> emitted from mechanical plant is not greater than the rating background level plus 3 at a sensitive use not associated with the development.</li> </ul> <p>Where T is</p> <ul style="list-style-type: none"> <li>• Day (7am to 6pm): 11hr,</li> <li>• Evening (6pm to 10pm): 4hr,</li> <li>• Night (10pm to 7am): 9 hr.</li> </ul>	<p><b>AO42</b></p> <p>Development ensures mechanical plant is <i>acoustically screened</i> from nearby sensitive uses.</p>



### 3.3 QDC MP4.4 – Road and Rail Traffic Noise

The QDC MP4.4 is intended to ensure that habitable rooms of *relevant residential buildings* located in transport noise corridors are designed and constructed to reduce transport noise from the gazetted or designated road or rail in question. Noise reduction requirements fall into categories, based on  $L_{10,18hr}$  or  $L_{Amax, 24hr}$  noise levels along the façades of the proposed development (see **Table 4**). Construction of the dwelling is then to “deemed to satisfy” solutions, see **Table 5**.

The proposed development sits within Noise Categories 2 and 3 of the *Transport Noise Corridor* for Abbotsford Road at ground level, based on the noise contours published by Brisbane City Council (see **Plate 3**), and Noise Category 2 of the *Transport Noise Corridor* for the rail line to the west at ground level, based on the noise contours published by DILGP. These are calculated rather than measured, and provision is made for a noise impact assessment to incorporate acoustic measurements to more accurately determine the relevant noise category for the dwelling.

**Table 4:** Noise levels associated with QDC MP4.4 Noise Categories

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	$\geq 73$ dB(A)	$\geq 85$ 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	$\leq 57$ dB(A)	$\leq 69$ dB(A)

**Table 5:** Performance requirements of QDC MP4.4

Performance Requirements	Acceptable Solutions
<b>Residential Buildings</b>	
<p><b>P1</b> <i>Habitable rooms in a relevant residential building are adequately protected from transport noise to safeguard occupants' health and amenity.</i></p>	<p><b>A1</b> The <i>external envelope</i> of each habitable room in a <i>relevant residential building</i> must comply with the minimum <math>R_w</math> for each building component specified in Schedule 1 to achieve a minimum <i>transport noise reduction</i> level for the relevant <i>noise category</i> by:</p> <p>a) Using materials specified in Schedule 2;</p> <p><b>OR</b></p> <p>b) Using materials with <i>manufacturer's specifications</i> that, in combination, achieve the minimum <math>R_w</math> value for the relevant building component and acceptable <i>noise category</i>.</p>

The revised categories are set out in **Section 4**. The default Deemed to Satisfy building solutions for these Categories, for use at Building Approval stage, are set out in **Appendix C**.

### 3.4 Air Conditioning - Noise Emissions

---

Alternative ventilation, such as air-conditioning, may be installed. State requirements are set out under the Environmental Protection Act 1994; in that Act noise from air conditioning must not exceed the following noise levels when measured as the LA90 dB(A) level over a period of 15 minutes at an affected building:

- Between 10pm and 7am: 3 dB(A) above the background level
- From 7am to 10pm: 5 dB(A) above the background level

It is considered that achieving the emission criteria set out in PO42 of the BCC Multiple Dwelling Code also achieves the less strict requirements of the EPA 1994. Noise mitigation for potential air conditioning is not within the scope of this report, although due to the high existing background levels the relevant criteria are considered readily achievable.

### 3.5 Environmental Protection (Noise) Policy 2008

---

The Environmental Protection (Noise) Policy 2008 establishes acoustic quality objectives to protect or enhance stated environmental values. The environmental values to be enhanced or protected under the policy are the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and the qualities of the acoustic environment that are conducive to human health and well-being, including ensuring a suitable acoustic environment for individual's to sleep, study and learn, to be involved in recreation including relaxation and conversation; and the qualities of the acoustic environment that are conducive to protecting the amenity of the community. The values are generally protected by meeting the acoustic quality objectives.

The ambient observations for this Report indicate that 'ordinary' road traffic noise is the dominant noise source at the development site. It is therefore concluded that the policy objectives for the environmental values of an individual are applied as part of this development approval by meeting the requirements of the QDC MP4.4.

### 3.6 State Development Assessment Provisions – Module 1 Community Noise

---

It is noted that Abbotsford Road is not a state-controlled road, and that the development site is not within 25m of a state-controlled road or railway land. It is therefore concluded that the provisions of Module 1 are not applicable to the proposed development.

### 3.7 Railway Noise

---

The development site is located approximately 50m from Bowen Hills station, and is potentially exposed to noise from railway passes-by. It is noted that Brisbane City Council no longer has a railway noise policy, and that the Module 1 provisions are not mandated as the site is further than 25m from railway land. The site is in a transport noise corridor for the railway, at least in part, as shown in **Plate 4**.

It is also noted that the site is exposed to road traffic noise, and is subject to design requirements under the QDC MP4.4. The default category for railway noise is Category 2, which is less stringent than the default Category 3 for road traffic noise. Façades that are most exposed to railway noise are also the most exposed to road traffic noise, which was considered to be the dominant noise source during the ambient noise survey. It is therefore considered that construction that achieves the design requirements of the QDC MP4.4 for road traffic noise will also mitigate railway noise.



## 4. Noise Impact Assessment

### 4.1 Brisbane City Council – Multiple Dwelling Code

#### 4.1.1 Car Parking and Vehicle Movements

The development plans show parking areas to be located below ground, with vehicle movement areas screened from neighbouring properties in concurrence with Acceptable Outcomes **AO21.1(a)**, **AO23.1** and **AO23.2** of the Multiple Dwelling Code.

#### 4.1.2 Air- Conditioners

It is expected that dwellings within the development will incorporate some form of air-conditioning. However the layout and plant selection is not known at this stage. The layout and selection of air-conditioning plant should be considered so that noise emission from the units does not exceed the noise emission criteria required by the BCC Multiple Dwelling Code, as presented in **Table 6** below. RBL calculations were made in accordance to the BCC Noise Impact Assessment Planning Scheme Policy.

**Table 6:** BCC Multiple Dwelling Code noise emission criteria, levels in dB(A)

	<b>PO42 criteria</b>	<b>Measured RBL</b>	<b>Maximum emission to nearby sensitive use</b>
Day	RBL + 3	57	60
Evening	RBL + 3	55	58
Night	RBL + 3	39	42

There is also an ongoing responsibility to comply with the requirements of the State of Queensland under the Environmental Protection Act 1994. The appropriate criteria to be met is set out in **Section 3.4**.

### 4.2 QDC MP4.4

New dwellings subject to Queensland Development Code Mandatory Part 4.4 – Buildings in a Transport Noise Corridor (“QDC MP4.4”) are built to the Category calculated on the basis of the  $L_{10, 18hr}$  or  $L_{Amax, 24hr}$  at its façade (this is height dependant, so different levels may have different Categories). This Code relates to the Habitable Rooms of a dwelling, and bedrooms are not differentiated from living rooms. The transport noise corridor overlay defines this property as being in Category 2 and 3 at ground level. This has been reconsidered in this report which is prepared generally in accordance with the Department of Transport and Main Roads’ *Code of Practice*. Road traffic noise is identified as the dominant noise source at the development site, and the applicable QDC categories as calculated for road traffic noise are also considered to appropriately mitigate railway noise.

The nearest major road is Abbotsford Road, which is adjacent to site. Future road traffic noise from Abbotsford Road has been calculated into the 10 year design horizon. Details of the road traffic noise model are presented in **Appendix B**. Results from the traffic noise model are presenting in **Tables 7 - 15** below. “Deemed to satisfy” building solutions for QDC MP4.4 Categories are presented in **Appendix C**.

It is recommended that balconies be largely “enclosed”; that is, the wing-walls and floor of solid construction. A ‘solid’ design has been shown to reduce noise within the centre of the balcony area, with a measured 3.5 dB(A) noise reduction over the façade level if solid balustrades are also included. It is unclear from development plans which – if any – balconies are to include solid balustrades, although a 3 dB(A) reduction to noise forecasts may be appropriate if solid balustrades are to be provided.

**Table 7:** Forecast  $L_{10,18hr}$  and corresponding QDC MP4.4 Categories, Level 1. Levels are in dB(A), façade-affected

Unit / Façade	$L_{10,18hr}$	Category	Minimum Rw Required for each component (Schedule 1, QDC MP4.4)					
			Glazing (<1.8m <sup>2</sup> )	Glazing (>1.8m <sup>2</sup> )	Walls	Roof/Ceiling	Floors	Entrance Doors
01 Living N	61	1	24	27	35	35	-	28
01 Bed 1 W	64	2	32	35	41	38	45	33
01 Bed 1 N	66	2	32	35	41	38	45	33
01 Bed 1 E	43	0	-	-	-	-	-	-
02 Bed 2 E	41	0	-	-	-	-	-	-
02 Bed 1 E	41	0	-	-	-	-	-	-
02 Bed 1 S	42	0	-	-	-	-	-	-
02 Living E	41	0	-	-	-	-	-	-
02 Living S	49	0	-	-	-	-	-	-
03 Living S	46	0	-	-	-	-	-	-
03 Bed 1 E	43	0	-	-	-	-	-	-
03 Bed 1 S	59	1	24	27	35	35	-	28
03 Bed 1 W	50	0	-	-	-	-	-	-
03 Bed 2 S	48	0	-	-	-	-	-	-
04 Bed 1 E	44	0	-	-	-	-	-	-
04 Bed 1 S	62	1	24	27	35	35	-	28
04 Bed 1 W	58	1	24	27	35	35	-	28
04 Living S	47	0	-	-	-	-	-	-
05 Bed 2 E	46	0	-	-	-	-	-	-
05 Bed 2 S	66	2	32	35	41	38	45	33
05 Bed 1 S	71	3	35	38	47	41	45	33
05 Bed 1 W	74	4	43	43	52	45	51	35
05 Bed 1 N	72	3	35	38	47	41	45	33
05 Living W	72	3	35	38	47	41	45	33
06 Dining S	73	4	43	43	52	45	51	35
06 Dining W	75	4	43	43	52	45	51	35
06 Living W	75	4	43	43	52	45	51	35
06 Living N	70	3	35	38	47	41	45	33
06 Bed 1 W	69	3	35	38	47	41	45	33
07 Bed 1 W	74	4	43	43	52	45	51	35
07 Bed 1 N	70	3	35	38	47	41	45	33
07 Living W	70	3	35	38	47	41	45	33
07 Living N	69	3	35	38	47	41	45	33

**Table 8:** Forecast  $L_{10,18hr}$  and corresponding QDC MP4.4 Categories, Level 2. Levels are in dB(A), façade-affected

Unit / Façade	$L_{10,18hr}$	Category	Minimum Rw Required for each component (Schedule 1, QDC MP4.4)					
			Glazing (<1.8m <sup>2</sup> )	Glazing (>1.8m <sup>2</sup> )	Walls	Roof/Ceiling	Floors	Entrance Doors
01 Living N	63	2	32	35	41	38	45	33
01 Bed 1 W	66	2	32	35	41	38	45	33
01 Bed 1 N	68	3	35	38	47	41	45	33
01 Bed 1 E	43	0	-	-	-	-	-	-
01 Bed 2 N	43	0	-	-	-	-	-	-
02 Bed 2 N	63	2	32	35	41	38	45	33
02 Bed 1 W	65	2	32	35	41	38	45	33
02 Bed 1 N	66	2	32	35	41	38	45	33
02 Bed 1 E	42	0	-	-	-	-	-	-
02 Living N	62	1	24	27	35	35	-	28
03 Living W	65	2	32	35	41	38	45	33
03 Living N	63	2	32	35	41	38	45	33
03 Living E	41	0	-	-	-	-	-	-
03 Bed 1 N	59	1	24	27	35	35	-	28
03 Bed 1 E	41	0	-	-	-	-	-	-
03 Bed 3 E	41	0	-	-	-	-	-	-
03 Bed 2 E	41	0	-	-	-	-	-	-
04 Bed 2 E	41	0	-	-	-	-	-	-
04 Bed 1 E	41	0	-	-	-	-	-	-
04 Bed 1 S	42	0	-	-	-	-	-	-
04 Living E	41	0	-	-	-	-	-	-
04 Living S	51	0	-	-	-	-	-	-
05 Living S	49	0	-	-	-	-	-	-
05 Bed 1 E	45	0	-	-	-	-	-	-
05 Bed 1 S	62	1	24	27	35	35	-	28
05 Bed 1 W	53	0	-	-	-	-	-	-
05 Bed 2 S	51	0	-	-	-	-	-	-
06 Bed 2 S	45	0	-	-	-	-	-	-
06 Bed 1 E	45	0	-	-	-	-	-	-
06 Bed 1 S	65	2	32	35	41	38	45	33
06 Bed 1 W	61	1	24	27	35	35	-	28
06 Living S	50	0	-	-	-	-	-	-
07 Bed 2 E	48	0	-	-	-	-	-	-
07 Bed 2 S	69	3	35	38	47	41	45	33
07 Bed 1 S	73	4	43	43	52	45	51	35
07 Ned 1 W	76	4	43	43	52	45	51	35
07 Bed 1 N	73	4	43	43	52	45	51	35
07 Living W	73	4	43	43	52	45	51	35
08 Dining S	74	4	43	43	52	45	51	35
08 Dining W	77	4	43	43	52	45	51	35
08 Living W	77	4	43	43	52	45	51	35
08 Living N	73	4	43	43	52	45	51	35
08 Bed 1 W	73	4	43	43	52	45	51	35
09 Bed 1 W	75	4	43	43	52	45	51	35
09 Bed 1 N	71	3	35	38	47	41	45	33
09 Living W	72	3	35	38	47	41	45	33
09 Living N	70	3	35	38	47	41	45	33



**Table 9:** Forecast  $L_{10,18hr}$  and corresponding QDC MP4.4 Categories, Level 3. Levels are in dB(A), façade-affected

Unit / Façade	$L_{10,18hr}$	Category	Minimum Rw Required for each component (Schedule 1, QDC MP4.4)					
			Glazing (<1.8m <sup>2</sup> )	Glazing (>1.8m <sup>2</sup> )	Walls	Roof/Ceiling	Floors	Entrance Doors
01 Living N	63	2	32	35	41	38	45	33
01 Bed 1 W	67	2	32	35	41	38	45	33
01 Bed 1 N	69	3	35	38	47	41	45	33
01 Bed 1 E	43	0	-	-	-	-	-	-
01 Bed 2 N	43	0	-	-	-	-	-	-
02 Bed 2 N	63	2	32	35	41	38	45	33
02 Bed 1 W	66	2	32	35	41	38	45	33
02 Bed 1 N	67	2	32	35	41	38	45	33
02 Bed 1 E	42	0	-	-	-	-	-	-
02 Living N	62	1	24	27	35	35	-	28
03 Living W	65	2	32	35	41	38	45	33
03 Living N	64	2	32	35	41	38	45	33
03 Living E	41	0	-	-	-	-	-	-
03 Bed 1 N	60	1	24	27	35	35	-	28
03 Bed 1 E	41	0	-	-	-	-	-	-
03 Bed 3 E	41	0	-	-	-	-	-	-
03 Bed 2 E	41	0	-	-	-	-	-	-
04 Bed 2 E	41	0	-	-	-	-	-	-
04 Bed 1 E	41	0	-	-	-	-	-	-
04 Bed 1 S	43	0	-	-	-	-	-	-
04 Living E	41	0	-	-	-	-	-	-
04 Living S	55	0	-	-	-	-	-	-
05 Living S	52	0	-	-	-	-	-	-
05 Bed 1 E	47	0	-	-	-	-	-	-
05 Bed 1 S	63	2	32	35	41	38	45	33
05 Bed 1 W	57	0	-	-	-	-	-	-
05 Bed 2 S	55	0	-	-	-	-	-	-
06 Bed 2 S	46	0	-	-	-	-	-	-
06 Bed 1 E	46	0	-	-	-	-	-	-
06 Bed 1 S	66	2	32	35	41	38	45	33
06 Bed 1 W	63	2	32	35	41	38	45	33
06 Living S	55	0	-	-	-	-	-	-
07 Bed 2 E	52	0	-	-	-	-	-	-
07 Bed 2 S	70	3	35	38	47	41	45	33
07 Bed 1 S	74	4	43	43	52	45	51	35
07 Ned 1 W	77	4	43	43	52	45	51	35
07 Bed 1 N	73	4	43	43	52	45	51	35
07 Living W	73	4	43	43	52	45	51	35
08 Dining S	74	4	43	43	52	45	51	35
08 Dining W	76	4	43	43	52	45	51	35
08 Living W	76	4	43	43	52	45	51	35
08 Living N	73	4	43	43	52	45	51	35
08 Bed 1 W	73	4	43	43	52	45	51	35
09 Bed 1 W	75	4	43	43	52	45	51	35
09 Bed 1 N	72	3	35	38	47	41	45	33
09 Living W	72	3	35	38	47	41	45	33
09 Living N	71	3	35	38	47	41	45	33

**Table 10:** Forecast  $L_{10, 18hr}$  and corresponding QDC MP4.4 Categories, Level 4. Levels are in dB(A), façade-affected

Unit / Façade	$L_{10, 18hr}$	Category	Minimum Rw Required for each component (Schedule 1, QDC MP4.4)					
			Glazing (<1.8m <sup>2</sup> )	Glazing (>1.8m <sup>2</sup> )	Walls	Roof/Ceiling	Floors	Entrance Doors
01 Living N	63	2	32	35	41	38	45	33
01 Bed 1 W	67	2	32	35	41	38	45	33
01 Bed 1 N	69	3	35	38	47	41	45	33
01 Bed 1 E	43	0	-	-	-	-	-	-
01 Bed 2 N	43	0	-	-	-	-	-	-
02 Bed 2 N	64	2	32	35	41	38	45	33
02 Bed 1 W	66	2	32	35	41	38	45	33
02 Bed 1 N	67	2	32	35	41	38	45	33
02 Bed 1 E	42	0	-	-	-	-	-	-
02 Living N	63	2	32	35	41	38	45	33
03 Living W	66	2	32	35	41	38	45	33
03 Living N	65	2	32	35	41	38	45	33
03 Living E	41	0	-	-	-	-	-	-
03 Bed 1 N	60	1	24	27	35	35	-	28
03 Bed 1 E	41	0	-	-	-	-	-	-
03 Bed 3 E	41	0	-	-	-	-	-	-
03 Bed 2 E	41	0	-	-	-	-	-	-
04 Bed 2 E	41	0	-	-	-	-	-	-
04 Bed 1 E	41	0	-	-	-	-	-	-
04 Bed 1 S	44	0	-	-	-	-	-	-
04 Living E	41	0	-	-	-	-	-	-
04 Living S	57	0	-	-	-	-	-	-
05 Living S	55	0	-	-	-	-	-	-
05 Bed 1 E	50	0	-	-	-	-	-	-
05 Bed 1 S	65	2	32	35	41	38	45	33
05 Bed 1 W	61	1	24	27	35	35	-	28
05 Bed 2 S	59	1	24	27	35	35	-	28
06 Bed 2 S	49	0	-	-	-	-	-	-
06 Bed 1 E	50	0	-	-	-	-	-	-
06 Bed 1 S	68	3	35	38	47	41	45	33
06 Bed 1 W	68	3	35	38	47	41	45	33
06 Living S	65	2	32	35	41	38	45	33
07 Bed 2 E	62	1	24	27	35	35	-	28
07 Bed 2 S	72	3	35	38	47	41	45	33
07 Bed 1 S	74	4	43	43	52	45	51	35
07 Bed 1 W	76	4	43	43	52	45	51	35
07 Bed 1 N	73	4	43	43	52	45	51	35
07 Living W	73	4	43	43	52	45	51	35
08 Dining S	73	4	43	43	52	45	51	35
08 Dining W	76	4	43	43	52	45	51	35
08 Living W	76	4	43	43	52	45	51	35
08 Living N	73	4	43	43	52	45	51	35
08 Bed 1 W	73	4	43	43	52	45	51	35
09 Bed 1 W	75	4	43	43	52	45	51	35
09 Bed 1 N	71	3	35	38	47	41	45	33
09 Living W	72	3	35	38	47	41	45	33
09 Living N	71	3	35	38	47	41	45	33

**Table 11:** Forecast  $L_{10, 18hr}$  and corresponding QDC MP4.4 Categories, Level 5. Levels are in dB(A), façade-affected

Unit / Façade	$L_{10, 18hr}$	Category	Minimum Rw Required for each component (Schedule 1, QDC MP4.4)					
			Glazing (<1.8m <sup>2</sup> )	Glazing (>1.8m <sup>2</sup> )	Walls	Roof/Ceiling	Floors	Entrance Doors
01 Living N	63	2	32	35	41	38	45	33
01 Bed 1 W	67	2	32	35	41	38	45	33
01 Bed 1 N	69	3	35	38	47	41	45	33
01 Bed 1 E	42	0	-	-	-	-	-	-
01 Bed 2 N	42	0	-	-	-	-	-	-
02 Bed 2 N	64	2	32	35	41	38	45	33
02 Bed 1 W	66	2	32	35	41	38	45	33
02 Bed 1 N	68	3	35	38	47	41	45	33
02 Bed 1 E	42	0	-	-	-	-	-	-
02 Living N	63	2	32	35	41	38	45	33
03 Living W	66	2	32	35	41	38	45	33
03 Living N	65	2	32	35	41	38	45	33
03 Living E	41	0	-	-	-	-	-	-
03 Bed 1 N	61	1	24	27	35	35	-	28
03 Bed 1 E	41	0	-	-	-	-	-	-
03 Bed 3 E	41	0	-	-	-	-	-	-
03 Bed 2 E	41	0	-	-	-	-	-	-
04 Bed 2 E	41	0	-	-	-	-	-	-
04 Bed 1 E	41	0	-	-	-	-	-	-
04 Bed 1 S	46	0	-	-	-	-	-	-
04 Living E	41	0	-	-	-	-	-	-
04 Living S	61	1	24	27	35	35	-	28
05 Living S	59	1	24	27	35	35	-	28
05 Bed 1 E	53	0	-	-	-	-	-	-
05 Bed 1 S	69	3	35	38	47	41	45	33
05 Bed 1 W	68	3	35	38	47	41	45	33
05 Bed 2 S	66	2	32	35	41	38	45	33
06 Bed 2 S	57	0	-	-	-	-	-	-
06 Bed 1 E	58	1	24	27	35	35	-	28
06 Bed 1 S	71	3	35	38	47	41	45	33
06 Bed 1 W	69	3	35	38	47	41	45	33
06 Living S	65	2	32	35	41	38	45	33
07 Bed 2 E	62	1	24	27	35	35	-	28
07 Bed 2 S	72	3	35	38	47	41	45	33
07 Bed 1 S	73	4	43	43	52	45	51	35
07 Ned 1 W	76	4	43	43	52	45	51	35
07 Bed 1 N	73	4	43	43	52	45	51	35
07 Living W	73	4	43	43	52	45	51	35
08 Dining S	73	4	43	43	52	45	51	35
08 Dining W	76	4	43	43	52	45	51	35
08 Living W	76	4	43	43	52	45	51	35
08 Living N	72	3	35	38	47	41	45	33
08 Bed 1 W	72	3	35	38	47	41	45	33
09 Bed 1 W	74	4	43	43	52	45	51	35
09 Bed 1 N	71	3	35	38	47	41	45	33
09 Living W	72	3	35	38	47	41	45	33
09 Living N	71	3	35	38	47	41	45	33



**Table 12:** Forecast  $L_{10, 18hr}$  and corresponding QDC MP4.4 Categories, Level 6. Levels are in dB(A), façade-affected

Unit / Façade	$L_{10, 18hr}$	Category	Minimum Rw Required for each component (Schedule 1, QDC MP4.4)					
			Glazing (<1.8m <sup>2</sup> )	Glazing (>1.8m <sup>2</sup> )	Walls	Roof/Ceiling	Floors	Entrance Doors
01 Living N	63	2	32	35	41	38	45	33
01 Bed 1 W	67	2	32	35	41	38	45	33
01 Bed 1 N	69	3	35	38	47	41	45	33
01 Bed 1 E	42	0	-	-	-	-	-	-
01 Bed 2 N	42	0	-	-	-	-	-	-
02 Bed 2 N	64	2	32	35	41	38	45	33
02 Bed 1 W	66	2	32	35	41	38	45	33
02 Bed 1 N	67	2	32	35	41	38	45	33
02 Bed 1 E	41	0	-	-	-	-	-	-
02 Living N	63	2	32	35	41	38	45	33
03 Living W	66	2	32	35	41	38	45	33
03 Living N	65	2	32	35	41	38	45	33
03 Living E	41	0	-	-	-	-	-	-
03 Bed 1 N	61	1	24	27	35	35	-	28
03 Bed 1 E	41	0	-	-	-	-	-	-
03 Bed 3 E	41	0	-	-	-	-	-	-
03 Bed 2 E	41	0	-	-	-	-	-	-
04 Bed 2 E	41	0	-	-	-	-	-	-
04 Bed 1 E	41	0	-	-	-	-	-	-
04 Bed 1 S	48	0	-	-	-	-	-	-
04 Living E	41	0	-	-	-	-	-	-
04 Living S	67	2	32	35	41	38	45	33
05 Living S	65	2	32	35	41	38	45	33
05 Bed 1 E	60	1	24	27	35	35	-	28
05 Bed 1 S	69	3	35	38	47	41	45	33
05 Bed 1 W	68	3	35	38	47	41	45	33
05 Bed 2 S	66	2	32	35	41	38	45	33
06 Bed 2 S	58	1	24	27	35	35	-	28
06 Bed 1 E	58	1	24	27	35	35	-	28
06 Bed 1 S	70	3	35	38	47	41	45	33
06 Bed 1 W	69	3	35	38	47	41	45	33
06 Living S	65	2	32	35	41	38	45	33
07 Bed 2 E	62	1	24	27	35	35	-	28
07 Bed 2 S	72	3	35	38	47	41	45	33
07 Bed 1 S	73	4	43	43	52	45	51	35
07 Ned 1 W	75	4	43	43	52	45	51	35
07 Bed 1 N	72	3	35	38	47	41	45	33
07 Living W	73	4	43	43	52	45	51	35
08 Dining S	73	4	43	43	52	45	51	35
08 Dining W	75	4	43	43	52	45	51	35
08 Living W	75	4	43	43	52	45	51	35
08 Living N	72	3	35	38	47	41	45	33
08 Bed 1 W	72	3	35	38	47	41	45	33
09 Bed 1 W	74	4	43	43	52	45	51	35
09 Bed 1 N	71	3	35	38	47	41	45	33
09 Living W	71	3	35	38	47	41	45	33
09 Living N	70	3	35	38	47	41	45	33

**Table 13:** Forecast  $L_{10, 18hr}$  and corresponding QDC MP4.4 Categories, Level 7. Levels are in dB(A), façade-affected

Unit / Façade	$L_{10, 18hr}$	Category	Minimum Rw Required for each component (Schedule 1, QDC MP4.4)					
			Glazing (<1.8m <sup>2</sup> )	Glazing (>1.8m <sup>2</sup> )	Walls	Roof/Ceiling	Floors	Entrance Doors
01 Living N	63	2	32	35	41	38	45	33
01 Bed 1 W	67	2	32	35	41	38	45	33
01 Bed 1 N	69	3	35	38	47	41	45	33
01 Bed 1 E	43	0	-	-	-	-	-	-
01 Bed 2 N	43	0	-	-	-	-	-	-
02 Bed 2 N	64	2	32	35	41	38	45	33
02 Bed 1 W	66	2	32	35	41	38	45	33
02 Bed 1 N	67	2	32	35	41	38	45	33
02 Bed 1 E	42	0	-	-	-	-	-	-
02 Living N	63	2	32	35	41	38	45	33
03 Living W	66	2	32	35	41	38	45	33
03 Living N	65	2	32	35	41	38	45	33
03 Living E	42	0	-	-	-	-	-	-
03 Bed 1 N	61	1	24	27	35	35	-	28
03 Bed 1 E	42	0	-	-	-	-	-	-
03 Bed 3 E	42	0	-	-	-	-	-	-
03 Bed 2 E	42	0	-	-	-	-	-	-
04 Bed 2 E	42	0	-	-	-	-	-	-
04 Bed 1 E	42	0	-	-	-	-	-	-
04 Bed 1 S	55	0	-	-	-	-	-	-
04 Living E	43	0	-	-	-	-	-	-
04 Living S	68	3	35	38	47	41	45	33
05 Living S	65	2	32	35	41	38	45	33
05 Bed 1 E	60	1	24	27	35	35	-	28
05 Bed 1 S	69	3	35	38	47	41	45	33
05 Bed 1 W	68	3	35	38	47	41	45	33
05 Bed 2 S	66	2	32	35	41	38	45	33
06 Bed 2 S	57	0	-	-	-	-	-	-
06 Bed 1 E	58	1	24	27	35	35	-	28
06 Bed 1 S	70	3	35	38	47	41	45	33
06 Bed 1 W	68	3	35	38	47	41	45	33
06 Living S	65	2	32	35	41	38	45	33
07 Bed 2 E	62	1	24	27	35	35	-	28
07 Bed 2 S	71	3	35	38	47	41	45	33
07 Bed 1 S	73	4	43	43	52	45	51	35
07 Ned 1 W	75	4	43	43	52	45	51	35
07 Bed 1 N	72	3	35	38	47	41	45	33
07 Living W	72	3	35	38	47	41	45	33
08 Dining S	72	3	35	38	47	41	45	33
08 Dining W	75	4	43	43	52	45	51	35
08 Living W	75	4	43	43	52	45	51	35
08 Living N	72	3	35	38	47	41	45	33
08 Bed 1 W	72	3	35	38	47	41	45	33
09 Bed 1 W	74	4	43	43	52	45	51	35
09 Bed 1 N	70	3	35	38	47	41	45	33
09 Living W	71	3	35	38	47	41	45	33
09 Living N	70	3	35	38	47	41	45	33

**Table 14:** Forecast  $L_{10, 18hr}$  and corresponding QDC MP4.4 Categories, Level 8. Levels are in dB(A), façade-affected

Unit / Façade	$L_{10, 18hr}$	Category	Minimum Rw Required for each component (Schedule 1, QDC MP4.4)					
			Glazing (<1.8m <sup>2</sup> )	Glazing (>1.8m <sup>2</sup> )	Walls	Roof/Ceiling	Floors	Entrance Doors
01 Living N	62	1	24	27	35	35	-	28
01 Bed 1 W	66	2	32	35	41	38	45	33
01 Bed 1 N	69	3	35	38	47	41	45	33
01 Bed 1 E	45	0	-	-	-	-	-	-
01 Bed 2 N	45	0	-	-	-	-	-	-
02 Bed 2 N	63	2	32	35	41	38	45	33
02 Bed 1 W	66	2	32	35	41	38	45	33
02 Bed 1 N	67	2	32	35	41	38	45	33
02 Bed 1 E	45	0	-	-	-	-	-	-
02 Living N	63	2	32	35	41	38	45	33
03 Living W	66	2	32	35	41	38	45	33
03 Living N	65	2	32	35	41	38	45	33
03 Living E	44	0	-	-	-	-	-	-
03 Bed 1 N	61	1	24	27	35	35	-	28
03 Bed 1 E	44	0	-	-	-	-	-	-
03 Bed 3 E	44	0	-	-	-	-	-	-
03 Bed 2 E	44	0	-	-	-	-	-	-
04 Bed 2 E	44	0	-	-	-	-	-	-
04 Bed 1 E	44	0	-	-	-	-	-	-
04 Bed 1 S	55	0	-	-	-	-	-	-
04 Living E	45	0	-	-	-	-	-	-
04 Living S	67	2	32	35	41	38	45	33
05 Living S	65	2	32	35	41	38	45	33
05 Bed 1 E	60	1	24	27	35	35	-	28
05 Bed 1 S	69	3	35	38	47	41	45	33
05 Bed 1 W	68	3	35	38	47	41	45	33
05 Bed 2 S	66	2	32	35	41	38	45	33
06 Bed 2 S	57	0	-	-	-	-	-	-
06 Bed 1 E	58	1	24	27	35	35	-	28
06 Bed 1 S	70	3	35	38	47	41	45	33
06 Bed 1 W	68	3	35	38	47	41	45	33
06 Living S	64	2	32	35	41	38	45	33
07 Bed 2 E	62	1	24	27	35	35	-	28
07 Bed 2 S	71	3	35	38	47	41	45	33
07 Bed 1 S	72	3	35	38	47	41	45	33
07 Ned 1 W	75	4	43	43	52	45	51	35
07 Bed 1 N	72	3	35	38	47	41	45	33
07 Living W	72	3	35	38	47	41	45	33
08 Dining S	72	3	35	38	47	41	45	33
08 Dining W	75	4	43	43	52	45	51	35
08 Living W	74	4	43	43	52	45	51	35
08 Living N	71	3	35	38	47	41	45	33
08 Bed 1 W	71	3	35	38	47	41	45	33
09 Bed 1 W	73	4	43	43	52	45	51	35
09 Bed 1 N	70	3	35	38	47	41	45	33
09 Living W	71	3	35	38	47	41	45	33
09 Living N	70	3	35	38	47	41	45	33



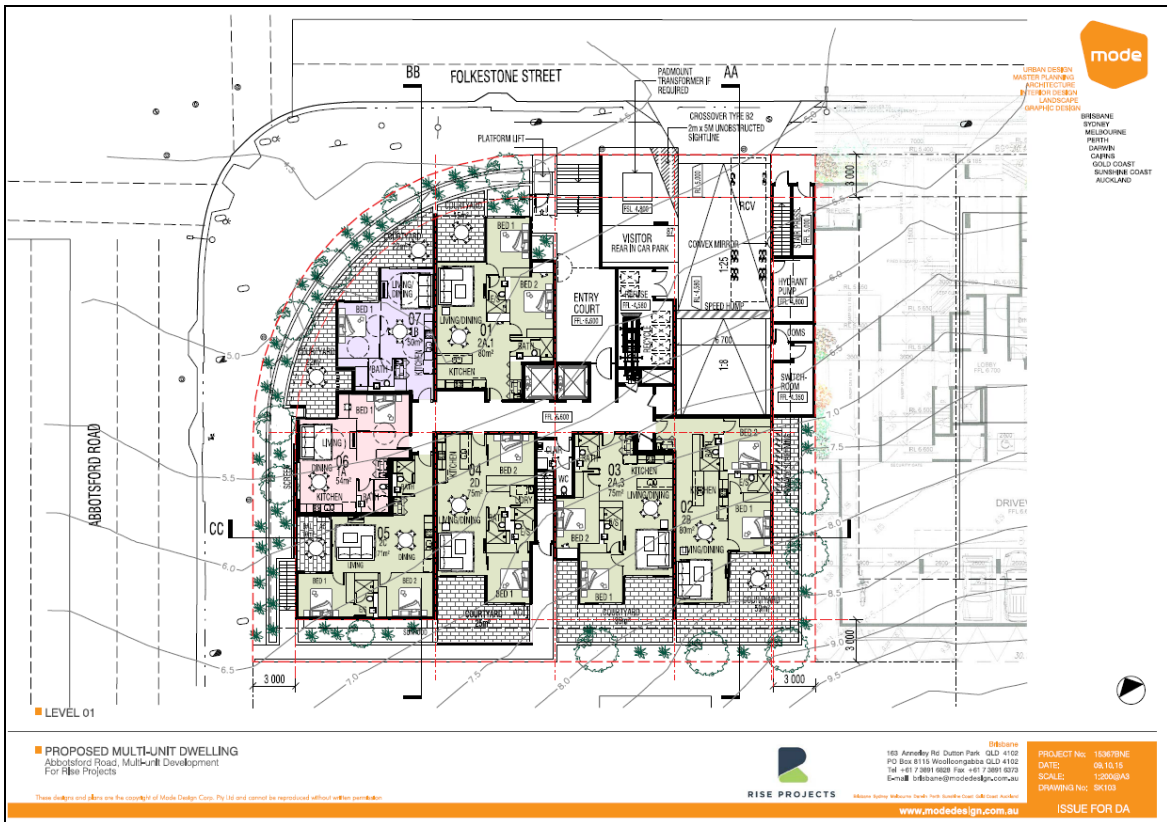
**Table 15:** Forecast  $L_{10, 18hr}$  and corresponding QDC MP4.4 Categories, Level 9. Levels are in dB(A), façade-affected

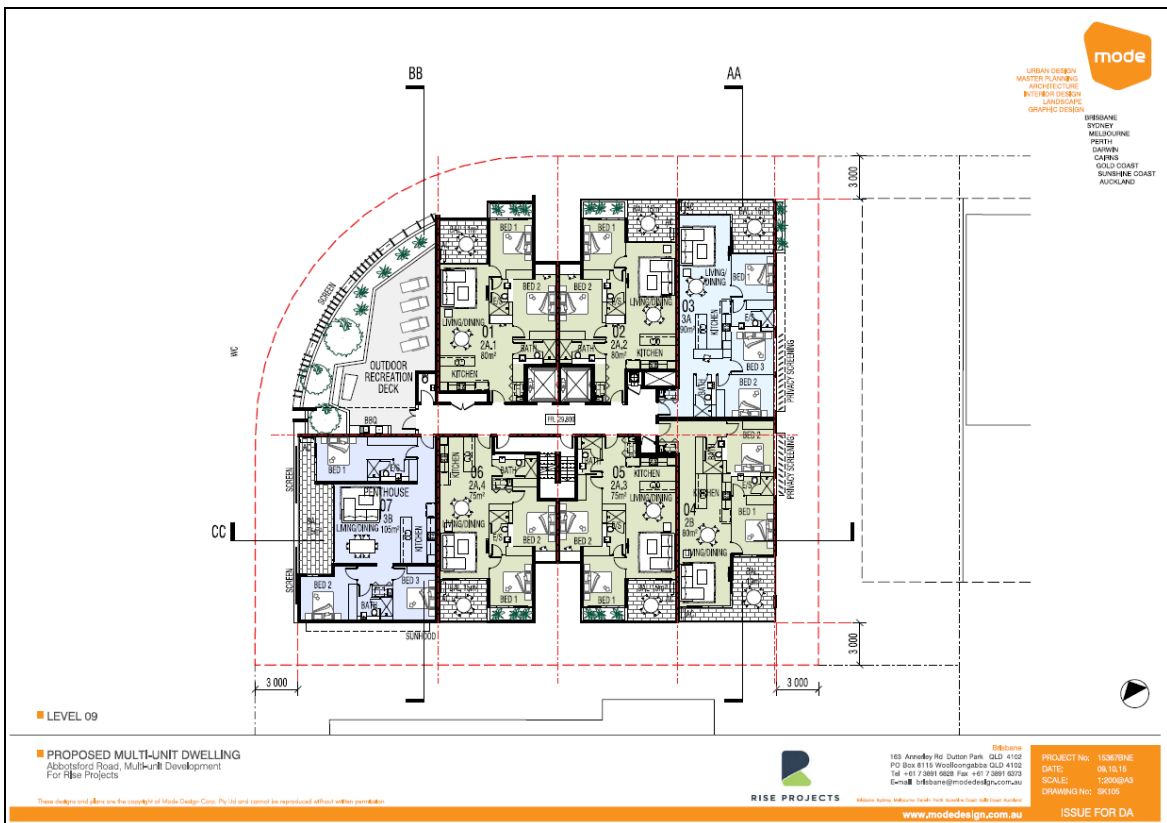
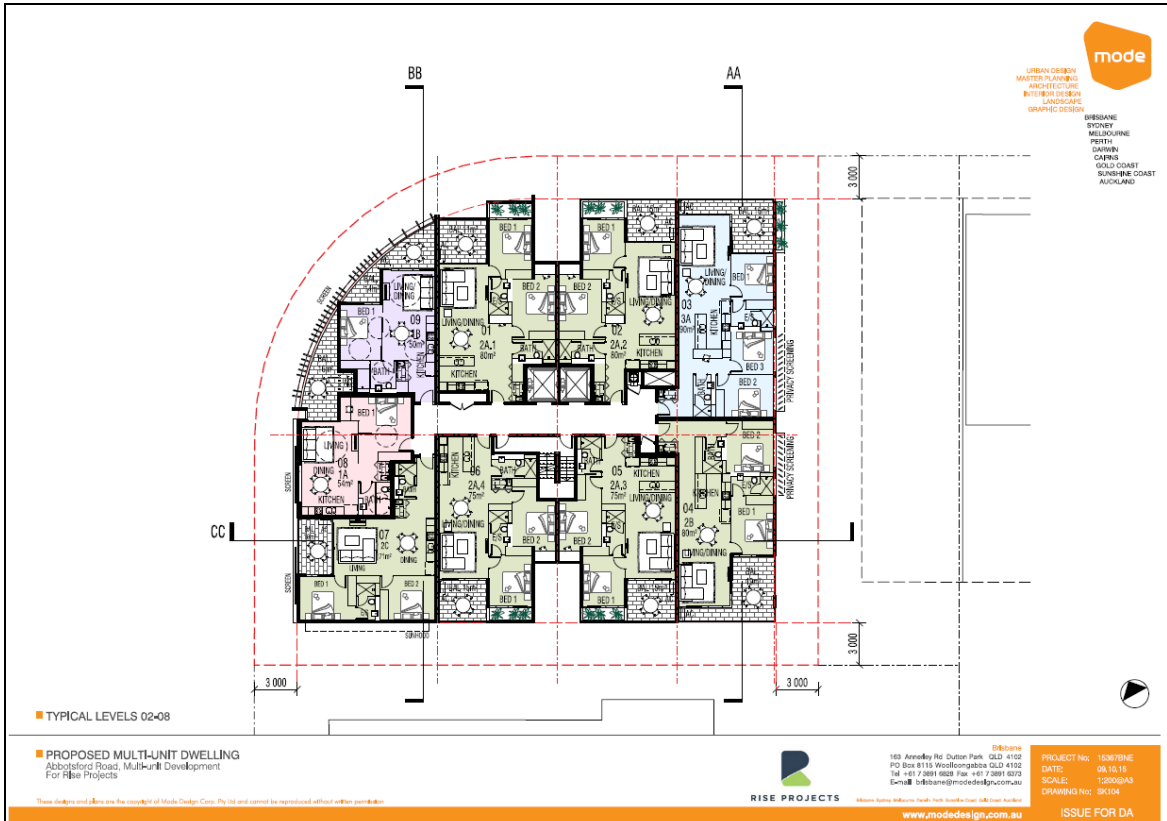
Unit / Façade	$L_{10, 18hr}$	Category	Minimum Rw Required for each component (Schedule 1, QDC MP4.4)					
			Glazing (<1.8m <sup>2</sup> )	Glazing (>1.8m <sup>2</sup> )	Walls	Roof/Ceiling	Floors	Entrance Doors
01 Living N	62	1	24	27	35	35	-	28
01 Bed 1 W	66	2	32	35	41	38	45	33
01 Bed 1 N	69	3	35	38	47	41	45	33
01 Bed 1 E	45	0	-	-	-	-	-	-
01 Bed 2 N	45	0	-	-	-	-	-	-
02 Bed 2 N	63	2	32	35	41	38	45	33
02 Bed 1 W	66	2	32	35	41	38	45	33
02 Bed 1 N	67	2	32	35	41	38	45	33
02 Bed 1 E	45	0	-	-	-	-	-	-
02 Living N	63	2	32	35	41	38	45	33
03 Living W	66	2	32	35	41	38	45	33
03 Living N	65	2	32	35	41	38	45	33
03 Living E	44	0	-	-	-	-	-	-
03 Bed 1 N	61	1	24	27	35	35	-	28
03 Bed 1 E	44	0	-	-	-	-	-	-
03 Bed 3 E	44	0	-	-	-	-	-	-
03 Bed 2 E	44	0	-	-	-	-	-	-
04 Bed 2 E	44	0	-	-	-	-	-	-
04 Bed 1 E	44	0	-	-	-	-	-	-
04 Bed 1 S	55	0	-	-	-	-	-	-
04 Living E	45	0	-	-	-	-	-	-
04 Living S	67	2	32	35	41	38	45	33
05 Living S	65	2	32	35	41	38	45	33
05 Bed 1 E	60	1	24	27	35	35	-	28
05 Bed 1 S	69	3	35	38	47	41	45	33
05 Bed 1 W	68	3	35	38	47	41	45	33
05 Bed 2 S	66	2	32	35	41	38	45	33
06 Bed 2 S	57	0	-	-	-	-	-	-
06 Bed 1 E	58	1	24	27	35	35	-	28
06 Bed 1 S	70	3	35	38	47	41	45	33
06 Bed 1 W	68	3	35	38	47	41	45	33
06 Living S	64	2	32	35	41	38	45	33
07 Bed 2 E	62	1	24	27	35	35	-	28
07 Bed 2 S	71	3	35	38	47	41	45	33
07 Bed 1 S	72	3	35	38	47	41	45	33
07 Ned 1 W	75	4	43	43	52	45	51	35
07 Bed 1 N	72	3	35	38	47	41	45	33
07 Living W	72	3	35	38	47	41	45	33
08 Dining S	72	3	35	38	47	41	45	33
08 Dining W	75	4	43	43	52	45	51	35
08 Living W	74	4	43	43	52	45	51	35
08 Living N	71	3	35	38	47	41	45	33
08 Bed 1 W	71	3	35	38	47	41	45	33
09 Bed 1 W	73	4	43	43	52	45	51	35
09 Bed 1 N	70	3	35	38	47	41	45	33
09 Living W	71	3	35	38	47	41	45	33
09 Living N	70	3	35	38	47	41	45	33

**Table 15:** Forecast  $L_{10, 18hr}$  and corresponding QDC MP4.4 Categories, Level 9. Levels are in dB(A), façade-affected

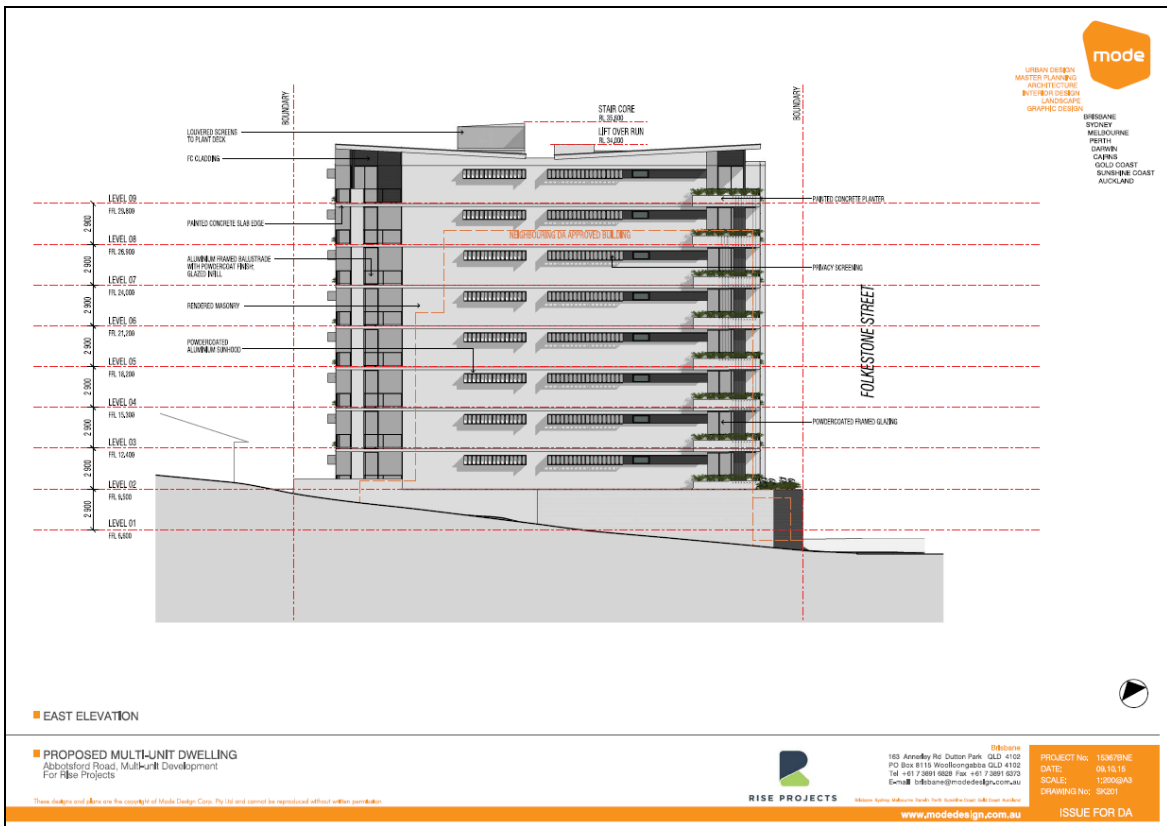
Unit / Façade	$L_{10, 18hr}$	Category	Minimum Rw Required for each component (Schedule 1, QDC MP4.4)					
			Glazing (<1.8m <sup>2</sup> )	Glazing (>1.8m <sup>2</sup> )	Walls	Roof/Ceiling	Floors	Entrance Doors
01 Living W	62	1	24	27	35	35	-	28
01 Living N	62	1	24	27	35	35	-	28
01 Bed 1 W	66	2	32	35	41	38	45	33
01 Bed 1 N	68	3	35	38	47	41	45	33
01 Bed 1 E	50	0	-	-	-	-	-	-
01 Bed 2 N	50	0	-	-	-	-	-	-
02 Bed 2 N	63	2	32	35	41	38	45	33
02 Bed 1 W	66	2	32	35	41	38	45	33
02 Bed 1 N	67	2	32	35	41	38	45	33
02 Bed 1 E	50	0	-	-	-	-	-	-
02 Living N	63	2	32	35	41	38	45	33
03 Living W	66	2	32	35	41	38	45	33
03 Living N	65	2	32	35	41	38	45	33
03 Living E	49	0	-	-	-	-	-	-
03 Bed 1 N	61	1	24	27	35	35	-	28
03 Bed 1 E	48	0	-	-	-	-	-	-
03 Bed 3 E	48	0	-	-	-	-	-	-
03 Bed 2 E	48	0	-	-	-	-	-	-
04 Bed 2 E	48	0	-	-	-	-	-	-
04 Bed 1 E	49	0	-	-	-	-	-	-
04 Bed 1 S	56	0	-	-	-	-	-	-
04 Living E	50	0	-	-	-	-	-	-
04 Living S	67	2	32	35	41	38	45	33
05 Living S	65	2	32	35	41	38	45	33
05 Bed 1 E	60	1	24	27	35	35	-	28
05 Bed 1 S	69	3	35	38	47	41	45	33
05 Bed 1 W	68	3	35	38	47	41	45	33
05 Bed 2 S	66	2	32	35	41	38	45	33
06 Bed 2 S	58	1	24	27	35	35	-	28
06 Bed 1 E	58	1	24	27	35	35	-	28
06 Bed 1 S	70	3	35	38	47	41	45	33
06 Bed 1 W	68	3	35	38	47	41	45	33
06 Living S	64	2	32	35	41	38	45	33
07 Bed 2 E	62	1	24	27	35	35	-	28
07 Bed 2 S	71	3	35	38	47	41	45	33
07 Bed 1 S	72	3	35	38	47	41	45	33
07 Ned 1 W	74	4	43	43	52	45	51	35
07 Bed 1 N	71	3	35	38	47	41	45	33
07 Living W	71	3	35	38	47	41	45	33
07 Bed 1 W	74	4	43	43	52	45	51	35

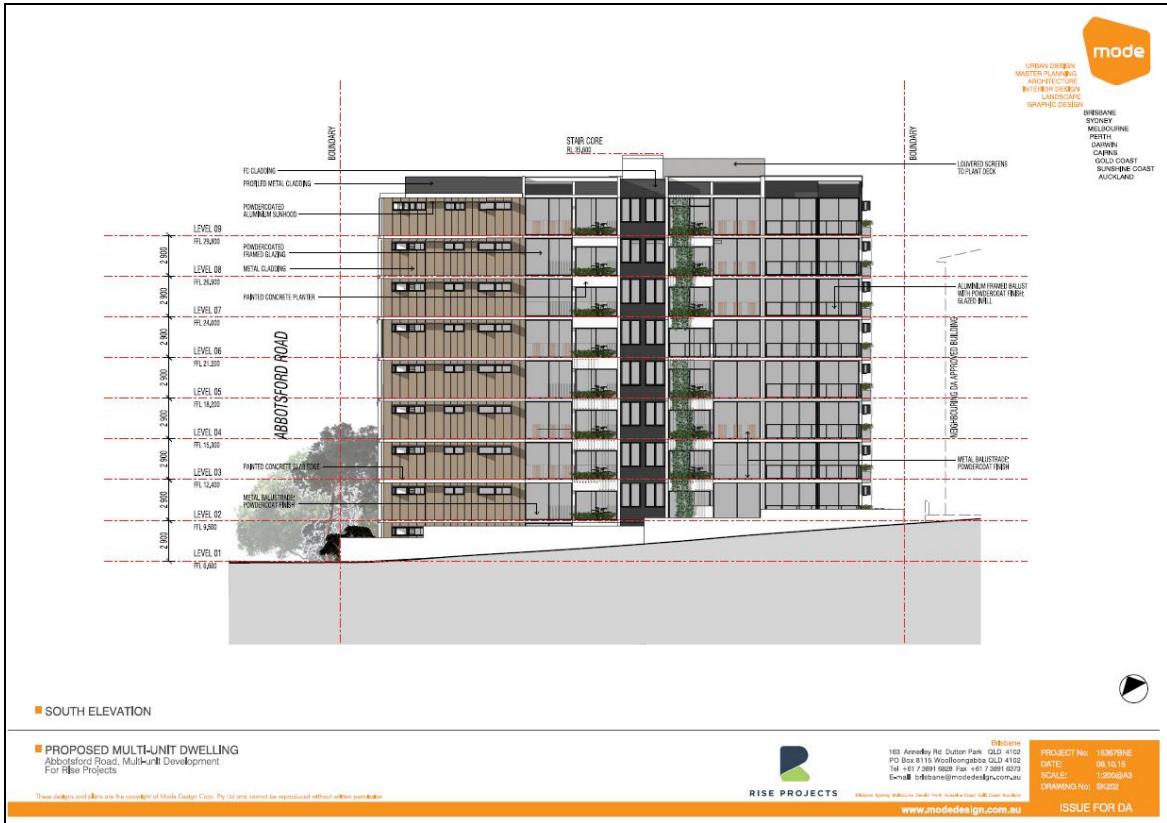
# Appendix A: Plans











## Appendix B: Traffic Noise Calculations

The 10-year design levels for traffic noise are calculated for the proposed development. Calculations are performed in accordance with Australian Standard AS2702-1984 Acoustics-Methods for the measurement of road traffic noise and 'Calculation of Road Traffic Noise', 1975-1988. Predicted levels for this report have been calculated using CRTN prediction models PEN3D2000 and are façade-adjusted. Traffic data was sourced from Veitch Lister, a professional transport planning consultancy. Topographic data was sourced from Brisbane City Council. The assumptions that were made for the calculations included-

- Abbotsford Road 2014 33,644 vehicles / 24hr
- Abbotsford Road 2024 36,707 vehicles / 24hr
- Heavy Vehicles 8.7% in 2015; 9.4% in 2025
- Traffic growth 0.87% pa
- 18hr traffic flow is 94% of 24hr
- Average traffic speed 50 km/hr
- source height 0.5m
- a bitumen road surface with 1 mm texture depth
- Predicted design level for ML1, 2014, 74.3 dB(A) L10, 18hr façade adjusted
- Measured level at ML1, 2014, 74.4 dB(A) L10, 18hr façade adjusted including noise from all sources

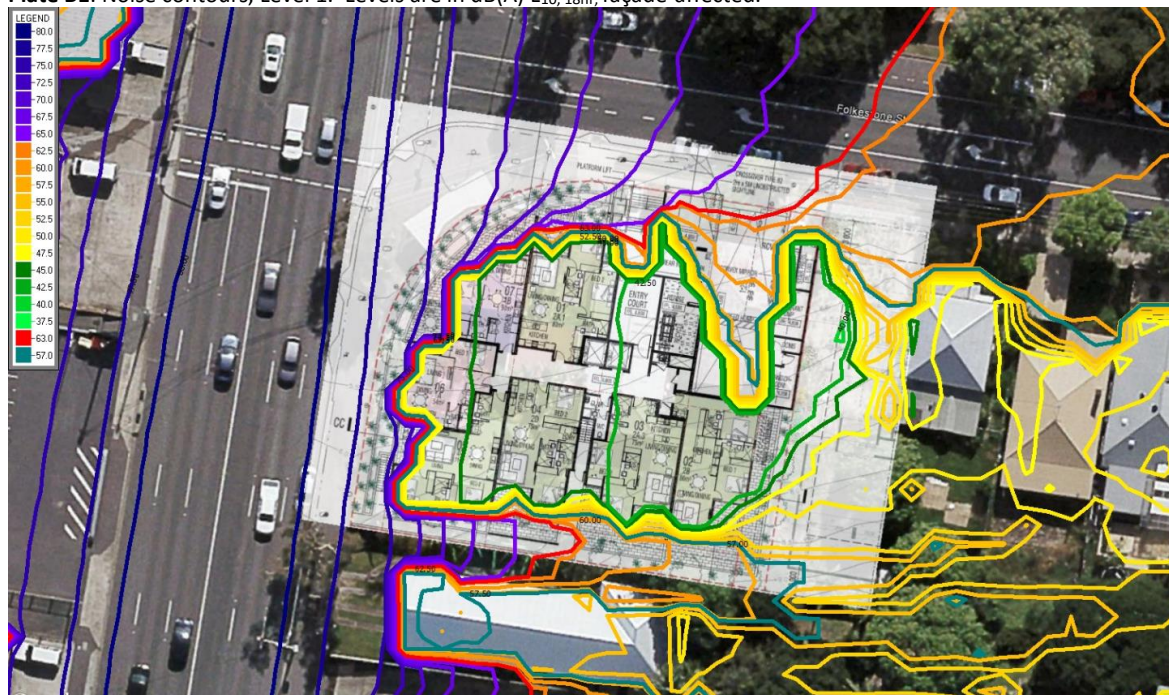
**Table B1:** Model Validation (façade adjusted L<sub>10</sub> (18hr) values, dB(A))

Location	Survey	PEN3D	Difference
ML1	74.4	74.3	-0.1

**Note:** The levels above show what is considered to be a good standard of fit between the road traffic model and measured levels.

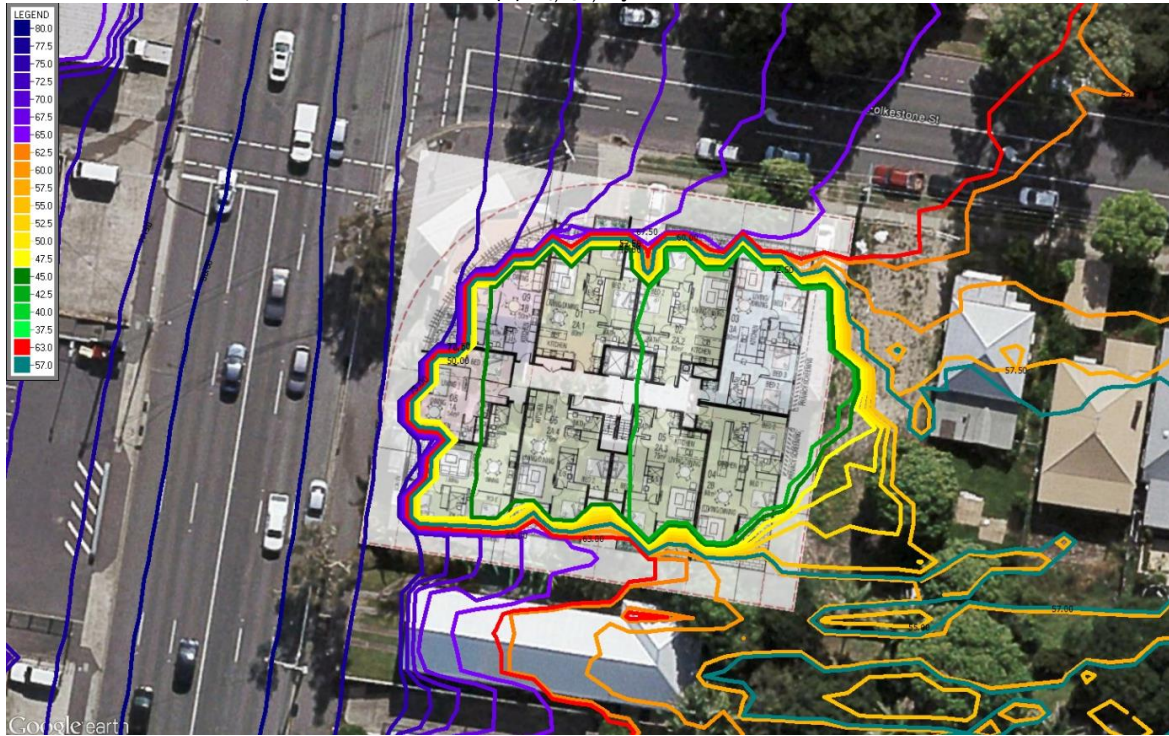
Results from the road traffic noise model are presented below.

**Plate B1:** Noise contours, Level 1. Levels are in dB(A) L<sub>10</sub>, 18hr, façade-affected.

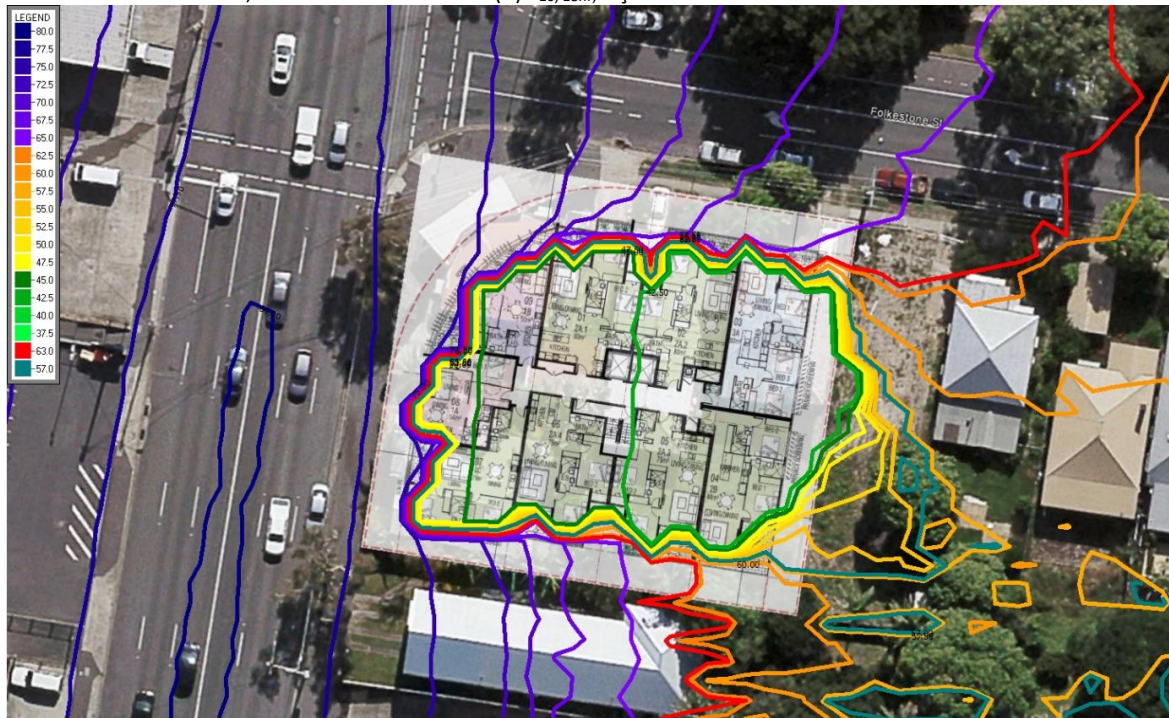




**Plate B2:** Noise contours, Level 2. Levels are in dB(A)  $L_{10, 18hr}$ , façade-affected.



**Plate B3:** Noise contours, Level 3. Levels are in dB(A)  $L_{10, 18hr}$ , façade-affected.





**Plate B4:** Noise contours, Level 4. Levels are in dB(A)  $L_{10, 18hr}$ , façade-affected.

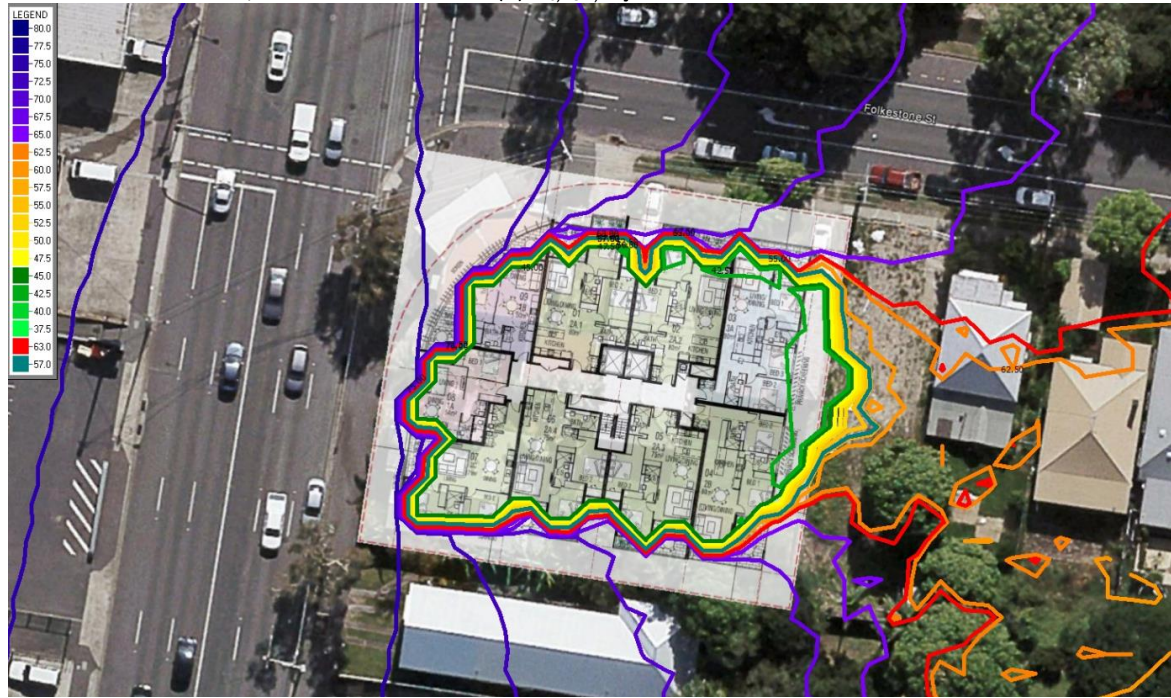


**Plate B5:** Noise contours, Level 5. Levels are in dB(A)  $L_{10, 18hr}$ , façade-affected.





**Plate B6:** Noise contours, Level 6. Levels are in dB(A)  $L_{10, 18hr}$ , façade-affected.



**Plate B7:** Noise contours, Level 7. Levels are in dB(A)  $L_{10, 18hr}$ , façade-affected.





**Plate B8:** Noise contours, Level 8. Levels are in dB(A)  $L_{10, 18hr}$ , façade-affected.



**Plate B9:** Noise contours, Level 9. Levels are in dB(A)  $L_{10, 18hr}$ , façade-affected.



**Table B2:** Receiver point calculations, Level 1. Levels are in dB(A) L<sub>10, 18hr</sub> façade-affected.

POINT CALCULATIONS					
Pen3D2000 V 1.9.32					
Project Code:3400					
Project Description:Bowen Rise					
File:Z:\Projects 3400 - 3449\3400 Bowen Rise, Abbotsford Rd, Bowen Hills Residential\Mode\3400 CRTN 2025 L1.PEN					
File Description: Level 1					
Wednesday 18 Nov, 2015 at 11:18:25					
CoRTN Calculations					
All road segments included. Segmentation angle: 10degrees. Road elevations apply.					
Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))	
01 Living N	503825.6	6964348	8.1	61.3	
01 Bed 1 W	503826.9	6964348	8.1	64.2	
01 Bed 1 N	503829.4	6964350	8.1	66	
01 Bed 1 E	503831.1	6964348	8.1	42.7	
02 Bed 2 E	503845.6	6964330	8.1	40.8	
02 Bed 1 E	503844.7	6964325	8.1	40.7	
02 Bed 1 S	503842.2	6964322	8.1	41.5	
02 Living E	503841	6964321	8.1	41.2	
02 Living S	503838.2	6964320	8.1	48.6	
03 Living S	503834.8	6964322	8.1	46.2	
03 Bed 1 E	503833.5	6964322	8.1	43.4	
03 Bed 1 S	503831.2	6964321	8.1	58.9	
03 Bed 1 W	503829.4	6964323	8.1	50.2	
03 Bed 2 S	503829.2	6964324	8.1	48	
04 Bed 1 E	503827.2	6964324	8.1	43.7	
04 Bed 1 S	503824.5	6964322	8.1	61.9	
04 Bed 1 W	503822.7	6964323	8.1	58.3	
04 Living S	503821.5	6964325	8.1	47.1	
05 Bed 2 E	503820.3	6964323	8.1	45.6	
05 Bed 2 S	503817.5	6964322	8.1	65.7	
05 Bed 1 S	503811.4	6964323	8.1	70.7	
05 Bed 1 W	503809.4	6964326	8.1	74.4	
05 Bed 1 N	503811.4	6964327	8.1	71.9	
05 Living W	503812.3	6964329	8.1	71.8	
06 Dining S	503811.8	6964330	8.1	72.8	
06 Dining W	503810.6	6964334	8.1	75.2	
06 Living W	503811.1	6964337	8.1	75.3	
06 Living N	503813.5	6964338	8.1	69.5	
06 Bed 1 W	503814.3	6964338	8.1	68.7	
07 Bed 1 W	503815.2	6964344	8.1	73.8	
07 Bed 1 N	503818	6964346	8.1	70.2	
07 Living W	503818.9	6964347	8.1	70	
07 Living N	503821.6	6964348	8.1	68.6	

**Table B3:** Receiver point calculations, Level 2. Levels are in dB(A) L<sub>10, 18hr</sub> façade-affected.

POINT CALCULATIONS					
Pen3D2000 V 1.9.32					
Project Code:3400					
Project Description:Bowen Rise					
File:Z:\Projects 3400 - 3449\3400 Bowen Rise, Abbotsford Rd, Bowen Hills Residential\Model\3400 CRTN 2025 L2.PEN					
File Description: L2					
Wednesday 18 Nov, 2015 at 11:19:40					
CoRTN Calculations					
All road segments included. Segmentation angle: 10degrees. Road elevations apply.					
Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))	
01 Living N	503825.6	6964347	11	62.5	
01 Bed 1 W	503827	6964348	11	66.3	
01 Bed 1 N	503829.4	6964350	11	68.1	
01 Bed 1 E	503831.1	6964348	11	42.7	
01 Bed 2 N	503831.2	6964347	11	42.6	
02 Bed 2 N	503832.9	6964346	11	62.7	
02 Bed 1 W	503833.5	6964347	11	65	
02 Bed 1 N	503835.9	6964349	11	66.1	
02 Bed 1 E	503837.7	6964347	11	41.8	
02 Living N	503838.9	6964347	11	61.7	
03 Living W	503840.5	6964347	11	64.6	
03 Living N	503843	6964348	11	63.3	
03 Living E	503845	6964346	11	40.8	
03 Bed 1 N	503846.1	6964345	11	58.9	
03 Bed 1 E	503847.6	6964342	11	40.6	
03 Bed 3 E	503846.8	6964337	11	40.6	
03 Bed 2 E	503846.2	6964334	11	40.6	
04 Bed 2 E	503845.6	6964330	11	40.8	
04 Bed 1 E	503844.6	6964325	11	40.7	
04 Bed 1 S	503842.3	6964323	11	42	
04 Living E	503840.9	6964321	11	41.2	
04 Living S	503838.3	6964320	11	51.4	
05 Living S	503834.7	6964322	11	49	
05 Bed 1 E	503833.3	6964322	11	44.8	
05 Bed 1 S	503831.3	6964321	11	61.8	
05 Bed 1 W	503829.5	6964323	11	53.1	
05 Bed 2 S	503829.4	6964324	11	51	
06 Bed 2 S	503827.5	6964325	11	44.5	
06 Bed 1 E	503827	6964323	11	44.5	
06 Bed 1 S	503824.7	6964322	11	64.8	
06 Bed 1 W	503822.8	6964323	11	61	
06 Living S	503821.7	6964324	11	49.9	
07 Bed 2 E	503820.1	6964323	11	47.5	
07 Bed 2 S	503817.1	6964322	11	68.7	
07 Bed 1 S	503811.3	6964323	11	73.3	
07 Ned 1 W	503809.6	6964325	11	76.4	
07 Bed 1 N	503811.6	6964327	11	73.1	
07 Living W	503812.5	6964329	11	73.1	
08 Dining S	503812	6964330	11	73.6	
08 Dining W	503810.8	6964333	11	76.5	
08 Living W	503811.3	6964337	11	76.5	
08 Living N	503813.7	6964338	11	73.1	
08 Bed 1 W	503814.6	6964338	11	72.8	
09 Bed 1 W	503815.4	6964344	11	74.9	
09 Bed 1 N	503818	6964346	11	71.4	
09 Living W	503819	6964346	11	71.7	
09 Living N	503821.7	6964348	11	70.3	



**Table B4:** Receiver point calculations, Level 3. Levels are in dB(A) L<sub>10, 18hr</sub> façade-affected.

POINT CALCULATIONS					
Pen3D2000 V 1.9.32					
Project Code:3400					
Project Description:Bowen Rise					
File:Z:\Projects 3400 - 3449\3400 Bowen Rise, Abbotsford Rd, Bowen Hills Residential\Model\3400 CRTN 2025 L3.PEN					
File Description: L3					
Wednesday 18 Nov, 2015 at 11:20:23					
CoRTN Calculations					
All road segments included. Segmentation angle: 10degrees. Road elevations apply.					
Receptor	X Posn	Y Posn	Height	L10(18hour)	
	(m)	(m)	(m)	(dB(A))	
01 Living N	503825.6	6964347	13.9	63.1	
01 Bed 1 W	503827	6964348	13.9	66.9	
01 Bed 1 N	503829.4	6964350	13.9	68.8	
01 Bed 1 E	503831.1	6964348	13.9	42.6	
01 Bed 2 N	503831.2	6964347	13.9	42.6	
02 Bed 2 N	503832.9	6964346	13.9	63.4	
02 Bed 1 W	503833.5	6964347	13.9	65.7	
02 Bed 1 N	503835.9	6964349	13.9	66.9	
02 Bed 1 E	503837.7	6964347	13.9	41.8	
02 Living N	503838.9	6964347	13.9	62.4	
03 Living W	503840.5	6964347	13.9	65.3	
03 Living N	503843	6964348	13.9	64	
03 Living E	503845	6964346	13.9	40.8	
03 Bed 1 N	503846.1	6964345	13.9	59.7	
03 Bed 1 E	503847.6	6964342	13.9	40.6	
03 Bed 3 E	503846.8	6964337	13.9	40.6	
03 Bed 2 E	503846.2	6964334	13.9	40.6	
04 Bed 2 E	503845.6	6964330	13.9	40.7	
04 Bed 1 E	503844.6	6964325	13.9	40.7	
04 Bed 1 S	503842.3	6964323	13.9	43.1	
04 Living E	503840.9	6964321	13.9	41.1	
04 Living S	503838.3	6964320	13.9	54.7	
05 Living S	503834.7	6964322	13.9	52.4	
05 Bed 1 E	503833.3	6964322	13.9	47.2	
05 Bed 1 S	503831.3	6964321	13.9	63.3	
05 Bed 1 W	503829.5	6964323	13.9	56.7	
05 Bed 2 S	503829.4	6964324	13.9	54.6	
06 Bed 2 S	503827.5	6964325	13.9	46.3	
06 Bed 1 E	503827	6964323	13.9	46.4	
06 Bed 1 S	503824.7	6964322	13.9	66.2	
06 Bed 1 W	503822.8	6964323	13.9	62.8	
06 Living S	503821.7	6964324	13.9	55.1	
07 Bed 2 E	503820.1	6964323	13.9	51.8	
07 Bed 2 S	503817.1	6964322	13.9	70	
07 Bed 1 S	503811.3	6964323	13.9	74	
07 Ned 1 W	503809.6	6964325	13.9	76.5	
07 Bed 1 N	503811.6	6964327	13.9	73.3	
07 Living W	503812.5	6964329	13.9	73.4	
08 Dining S	503812	6964330	13.9	73.7	
08 Dining W	503810.8	6964333	13.9	76.4	
08 Living W	503811.3	6964337	13.9	76.3	
08 Living N	503813.7	6964338	13.9	73.1	
08 Bed 1 W	503814.6	6964338	13.9	72.9	
09 Bed 1 W	503815.4	6964344	13.9	74.8	
09 Bed 1 N	503818	6964346	13.9	71.5	
09 Living W	503819	6964346	13.9	72	
09 Living N	503821.7	6964348	13.9	70.9	

**Table B5:** Receiver point calculations, Level 4. Levels are in dB(A) L<sub>10, 18hr</sub> façade-affected.

POINT CALCULATIONS					
Pen3D2000 V 1.9.32					
Project Code:3400					
Project Description:Bowen Rise					
File:Z:\Projects 3400 - 3449\3400 Bowen Rise, Abbotsford Rd, Bowen Hills Residential\Model\3400 CRTN 2025 L4.PEN					
File Description:L4					
Wednesday 18 Nov, 2015 at 11:21:02					
CoRTN Calculations					
All road segments included. Segmentation angle: 10degrees. Road elevations apply.					
Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))	
01 Living N	503825.6	6964347	16.8	63	
01 Bed 1 W	503827	6964348	16.8	67	
01 Bed 1 N	503829.4	6964350	16.8	69.1	
01 Bed 1 E	503831.1	6964348	16.8	42.5	
01 Bed 2 N	503831.2	6964347	16.8	42.5	
02 Bed 2 N	503832.9	6964346	16.8	63.8	
02 Bed 1 W	503833.5	6964347	16.8	66.1	
02 Bed 1 N	503835.9	6964349	16.8	67.3	
02 Bed 1 E	503837.7	6964347	16.8	41.7	
02 Living N	503838.9	6964347	16.8	62.9	
03 Living W	503840.5	6964347	16.8	65.8	
03 Living N	503843	6964348	16.8	64.5	
03 Living E	503845	6964346	16.8	40.7	
03 Bed 1 N	503846.1	6964345	16.8	60.2	
03 Bed 1 E	503847.6	6964342	16.8	40.5	
03 Bed 3 E	503846.8	6964337	16.8	40.5	
03 Bed 2 E	503846.2	6964334	16.8	40.5	
04 Bed 2 E	503845.6	6964330	16.8	40.7	
04 Bed 1 E	503844.6	6964325	16.8	40.7	
04 Bed 1 S	503842.3	6964323	16.8	44.1	
04 Living E	503840.9	6964321	16.8	41.1	
04 Living S	503838.3	6964320	16.8	57.2	
05 Living S	503834.7	6964322	16.8	55.2	
05 Bed 1 E	503833.3	6964322	16.8	49.5	
05 Bed 1 S	503831.3	6964321	16.8	64.6	
05 Bed 1 W	503829.5	6964323	16.8	60.8	
05 Bed 2 S	503829.4	6964324	16.8	58.5	
06 Bed 2 S	503827.5	6964325	16.8	49.3	
06 Bed 1 E	503827	6964323	16.8	49.6	
06 Bed 1 S	503824.7	6964322	16.8	68.4	
06 Bed 1 W	503822.8	6964323	16.8	68.3	
06 Living S	503821.7	6964324	16.8	64.8	
07 Bed 2 E	503820.1	6964323	16.8	62.2	
07 Bed 2 S	503817.1	6964322	16.8	72	
07 Bed 1 S	503811.3	6964323	16.8	73.7	
07 Ned 1 W	503809.6	6964325	16.8	76.2	
07 Bed 1 N	503811.6	6964327	16.8	73	
07 Living W	503812.5	6964329	16.8	73.1	
08 Dining S	503812	6964330	16.8	73.4	
08 Dining W	503810.8	6964333	16.8	76	
08 Living W	503811.3	6964337	16.8	76	
08 Living N	503813.7	6964338	16.8	72.8	
08 Bed 1 W	503814.6	6964338	16.8	72.6	
09 Bed 1 W	503815.4	6964344	16.8	74.5	
09 Bed 1 N	503818	6964346	16.8	71.3	
09 Living W	503819	6964346	16.8	71.8	
09 Living N	503821.7	6964348	16.8	70.7	

**Table B6:** Receiver point calculations, Level 5. Levels are in dB(A) L<sub>10, 18hr</sub> façade-affected.

POINT CALCULATIONS					
Pen3D2000 V 1.9.32					
Project Code:3400					
Project Description:Bowen Rise					
File:Z:\Projects 3400 - 3449\3400 Bowen Rise, Abbotsford Rd, Bowen Hills Residential\Model\3400 CRTN 2025 L5.PEN					
File Description:L5					
Wednesday 18 Nov, 2015 at 11:21:33					
CoRTN Calculations					
All road segments included. Segmentation angle: 10degrees. Road elevations apply.					
Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))	
01 Living N	503825.6	6964347	19.7	62.9	
01 Bed 1 W	503827	6964348	19.7	66.9	
01 Bed 1 N	503829.4	6964350	19.7	69	
01 Bed 1 E	503831.1	6964348	19.7	42.4	
01 Bed 2 N	503831.2	6964347	19.7	42.4	
02 Bed 2 N	503832.9	6964346	19.7	63.8	
02 Bed 1 W	503833.5	6964347	19.7	66.2	
02 Bed 1 N	503835.9	6964349	19.7	67.5	
02 Bed 1 E	503837.7	6964347	19.7	41.6	
02 Living N	503838.9	6964347	19.7	63.2	
03 Living W	503840.5	6964347	19.7	66.2	
03 Living N	503843	6964348	19.7	64.9	
03 Living E	503845	6964346	19.7	40.7	
03 Bed 1 N	503846.1	6964345	19.7	60.5	
03 Bed 1 E	503847.6	6964342	19.7	40.5	
03 Bed 3 E	503846.8	6964337	19.7	40.5	
03 Bed 2 E	503846.2	6964334	19.7	40.5	
04 Bed 2 E	503845.6	6964330	19.7	40.6	
04 Bed 1 E	503844.6	6964325	19.7	40.6	
04 Bed 1 S	503842.3	6964323	19.7	45.5	
04 Living E	503840.9	6964321	19.7	41	
04 Living S	503838.3	6964320	19.7	60.7	
05 Living S	503834.7	6964322	19.7	59.4	
05 Bed 1 E	503833.3	6964322	19.7	52.9	
05 Bed 1 S	503831.3	6964321	19.7	68.7	
05 Bed 1 W	503829.5	6964323	19.7	68.1	
05 Bed 2 S	503829.4	6964324	19.7	66.3	
06 Bed 2 S	503827.5	6964325	19.7	57.3	
06 Bed 1 E	503827	6964323	19.7	57.6	
06 Bed 1 S	503824.7	6964322	19.7	70.5	
06 Bed 1 W	503822.8	6964323	19.7	68.7	
06 Living S	503821.7	6964324	19.7	64.8	
07 Bed 2 E	503820.1	6964323	19.7	62.1	
07 Bed 2 S	503817.1	6964322	19.7	71.8	
07 Bed 1 S	503811.3	6964323	19.7	73.4	
07 Ned 1 W	503809.6	6964325	19.7	75.8	
07 Bed 1 N	503811.6	6964327	19.7	72.6	
07 Living W	503812.5	6964329	19.7	72.8	
08 Dining S	503812	6964330	19.7	73.1	
08 Dining W	503810.8	6964333	19.7	75.7	
08 Living W	503811.3	6964337	19.7	75.6	
08 Living N	503813.7	6964338	19.7	72.4	
08 Bed 1 W	503814.6	6964338	19.7	72.3	
09 Bed 1 W	503815.4	6964344	19.7	74.2	
09 Bed 1 N	503818	6964346	19.7	71	
09 Living W	503819	6964346	19.7	71.5	
09 Living N	503821.7	6964348	19.7	70.5	

**Table B7:** Receiver point calculations, Level 6. Levels are in dB(A) L<sub>10, 18hr</sub> façade-affected.

POINT CALCULATIONS					
Pen3D2000 V 1.9.32					
Project Code:3400					
Project Description:Bowen Rise					
File:Z:\Projects 3400 - 3449\3400 Bowen Rise, Abbotsford Rd, Bowen Hills Residential\Model\3400 CRTN 2025 L6.PEN					
File Description: L6					
Wednesday 18 Nov, 2015 at 11:22:04					
CoRTN Calculations					
All road segments included. Segmentation angle: 10degrees. Road elevations apply.					
Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))	
01 Living N	503825.6	6964347	22.6	62.7	
01 Bed 1 W	503827	6964348	22.6	66.7	
01 Bed 1 N	503829.4	6964350	22.6	68.8	
01 Bed 1 E	503831.1	6964348	22.6	42.3	
01 Bed 2 N	503831.2	6964347	22.6	42.2	
02 Bed 2 N	503832.9	6964346	22.6	63.6	
02 Bed 1 W	503833.5	6964347	22.6	66	
02 Bed 1 N	503835.9	6964349	22.6	67.4	
02 Bed 1 E	503837.7	6964347	22.6	41.4	
02 Living N	503838.9	6964347	22.6	63.1	
03 Living W	503840.5	6964347	22.6	66.1	
03 Living N	503843	6964348	22.6	65	
03 Living E	503845	6964346	22.6	40.7	
03 Bed 1 N	503846.1	6964345	22.6	60.7	
03 Bed 1 E	503847.6	6964342	22.6	40.5	
03 Bed 3 E	503846.8	6964337	22.6	40.5	
03 Bed 2 E	503846.2	6964334	22.6	40.5	
04 Bed 2 E	503845.6	6964330	22.6	40.7	
04 Bed 1 E	503844.6	6964325	22.6	40.8	
04 Bed 1 S	503842.3	6964323	22.6	47.7	
04 Living E	503840.9	6964321	22.6	41.2	
04 Living S	503838.3	6964320	22.6	67.1	
05 Living S	503834.7	6964322	22.6	65	
05 Bed 1 E	503833.3	6964322	22.6	60.3	
05 Bed 1 S	503831.3	6964321	22.6	69.3	
05 Bed 1 W	503829.5	6964323	22.6	68.2	
05 Bed 2 S	503829.4	6964324	22.6	66.2	
06 Bed 2 S	503827.5	6964325	22.6	57.5	
06 Bed 1 E	503827	6964323	22.6	57.7	
06 Bed 1 S	503824.7	6964322	22.6	70.3	
06 Bed 1 W	503822.8	6964323	22.6	68.6	
06 Living S	503821.7	6964324	22.6	64.6	
07 Bed 2 E	503820.1	6964323	22.6	62	
07 Bed 2 S	503817.1	6964322	22.6	71.6	
07 Bed 1 S	503811.3	6964323	22.6	73.1	
07 Ned 1 W	503809.6	6964325	22.6	75.4	
07 Bed 1 N	503811.6	6964327	22.6	72.3	
07 Living W	503812.5	6964329	22.6	72.5	
08 Dining S	503812	6964330	22.6	72.7	
08 Dining W	503810.8	6964333	22.6	75.3	
08 Living W	503811.3	6964337	22.6	75.2	
08 Living N	503813.7	6964338	22.6	72.1	
08 Bed 1 W	503814.6	6964338	22.6	72	
09 Bed 1 W	503815.4	6964344	22.6	73.9	
09 Bed 1 N	503818	6964346	22.6	70.7	
09 Living W	503819	6964346	22.6	71.2	
09 Living N	503821.7	6964348	22.6	70.2	

**Table B8:** Receiver point calculations, Level 7. Levels are in dB(A) L<sub>10, 18hr</sub> façade-affected.

POINT CALCULATIONS					
Pen3D2000 V 1.9.32					
Project Code:3400					
Project Description:Bowen Rise					
File:Z:\Projects 3400 - 3449\3400 Bowen Rise, Abbotsford Rd, Bowen Hills Residential\Model\3400 CRTN 2025 L7.PEN					
File Description:L7					
Wednesday 18 Nov, 2015 at 11:22:50					
CoRTN Calculations					
All road segments included. Segmentation angle: 10degrees. Road elevations apply.					
Receptor	X Posn	Y Posn	Height	L10(18hour)	
	(m)	(m)	(m)	(dB(A))	
01 Living N	503825.6	6964347	25.5	62.5	
01 Bed 1 W	503827	6964348	25.5	66.5	
01 Bed 1 N	503829.4	6964350	25.5	68.7	
01 Bed 1 E	503831.1	6964348	25.5	42.9	
01 Bed 2 N	503831.2	6964347	25.5	42.8	
02 Bed 2 N	503832.9	6964346	25.5	63.5	
02 Bed 1 W	503833.5	6964347	25.5	65.9	
02 Bed 1 N	503835.9	6964349	25.5	67.2	
02 Bed 1 E	503837.7	6964347	25.5	42.4	
02 Living N	503838.9	6964347	25.5	63	
03 Living W	503840.5	6964347	25.5	66	
03 Living N	503843	6964348	25.5	64.9	
03 Living E	503845	6964346	25.5	41.8	
03 Bed 1 N	503846.1	6964345	25.5	60.6	
03 Bed 1 E	503847.6	6964342	25.5	41.6	
03 Bed 3 E	503846.8	6964337	25.5	41.5	
03 Bed 2 E	503846.2	6964334	25.5	41.5	
04 Bed 2 E	503845.6	6964330	25.5	41.6	
04 Bed 1 E	503844.6	6964325	25.5	41.9	
04 Bed 1 S	503842.3	6964323	25.5	54.8	
04 Living E	503840.9	6964321	25.5	42.5	
04 Living S	503838.3	6964320	25.5	67.5	
05 Living S	503834.7	6964322	25.5	64.9	
05 Bed 1 E	503833.3	6964322	25.5	60.3	
05 Bed 1 S	503831.3	6964321	25.5	69.2	
05 Bed 1 W	503829.5	6964323	25.5	68.1	
05 Bed 2 S	503829.4	6964324	25.5	66.1	
06 Bed 2 S	503827.5	6964325	25.5	57.4	
06 Bed 1 E	503827	6964323	25.5	57.6	
06 Bed 1 S	503824.7	6964322	25.5	70.2	
06 Bed 1 W	503822.8	6964323	25.5	68.4	
06 Living S	503821.7	6964324	25.5	64.5	
07 Bed 2 E	503820.1	6964323	25.5	61.8	
07 Bed 2 S	503817.1	6964322	25.5	71.3	
07 Bed 1 S	503811.3	6964323	25.5	72.7	
07 Ned 1 W	503809.6	6964325	25.5	75	
07 Bed 1 N	503811.6	6964327	25.5	71.9	
07 Living W	503812.5	6964329	25.5	72.1	
08 Dining S	503812	6964330	25.5	72.4	
08 Dining W	503810.8	6964333	25.5	74.9	
08 Living W	503811.3	6964337	25.5	74.8	
08 Living N	503813.7	6964338	25.5	71.7	
08 Bed 1 W	503814.6	6964338	25.5	71.6	
09 Bed 1 W	503815.4	6964344	25.5	73.6	
09 Bed 1 N	503818	6964346	25.5	70.4	
09 Living W	503819	6964346	25.5	70.9	
09 Living N	503821.7	6964348	25.5	70	



**Table B9:** Receiver point calculations, Level 8. Levels are in dB(A) L<sub>10, 18hr</sub> façade-affected.

POINT CALCULATIONS					
Pen3D2000 V 1.9.32					
Project Code:3400					
Project Description:Bowen Rise					
File:Z:\Projects 3400 - 3449\3400 Bowen Rise, Abbotsford Rd, Bowen Hills Residential\Model\3400 CRTN 2025 L8.PEN					
File Description:L8					
Wednesday 18 Nov, 2015 at 11:23:26					
CoRTN Calculations					
All road segments included. Segmentation angle: 10degrees. Road elevations apply.					
Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))	
01 Living N	503825.6	6964347	28.4	62.3	
01 Bed 1 W	503827	6964348	28.4	66.3	
01 Bed 1 N	503829.4	6964350	28.4	68.5	
01 Bed 1 E	503831.1	6964348	28.4	45.3	
01 Bed 2 N	503831.2	6964347	28.4	45.3	
02 Bed 2 N	503832.9	6964346	28.4	63.3	
02 Bed 1 W	503833.5	6964347	28.4	65.7	
02 Bed 1 N	503835.9	6964349	28.4	67.1	
02 Bed 1 E	503837.7	6964347	28.4	44.8	
02 Living N	503838.9	6964347	28.4	62.9	
03 Living W	503840.5	6964347	28.4	65.9	
03 Living N	503843	6964348	28.4	64.8	
03 Living E	503845	6964346	28.4	44.2	
03 Bed 1 N	503846.1	6964345	28.4	60.6	
03 Bed 1 E	503847.6	6964342	28.4	43.8	
03 Bed 3 E	503846.8	6964337	28.4	43.6	
03 Bed 2 E	503846.2	6964334	28.4	43.7	
04 Bed 2 E	503845.6	6964330	28.4	43.9	
04 Bed 1 E	503844.6	6964325	28.4	44.2	
04 Bed 1 S	503842.3	6964323	28.4	55.1	
04 Living E	503840.9	6964321	28.4	45	
04 Living S	503838.3	6964320	28.4	67.4	
05 Living S	503834.7	6964322	28.4	64.9	
05 Bed 1 E	503833.3	6964322	28.4	60.3	
05 Bed 1 S	503831.3	6964321	28.4	69.1	
05 Bed 1 W	503829.5	6964323	28.4	68	
05 Bed 2 S	503829.4	6964324	28.4	66	
06 Bed 2 S	503827.5	6964325	28.4	57.4	
06 Bed 1 E	503827	6964323	28.4	57.6	
06 Bed 1 S	503824.7	6964322	28.4	70	
06 Bed 1 W	503822.8	6964323	28.4	68.2	
06 Living S	503821.7	6964324	28.4	64.3	
07 Bed 2 E	503820.1	6964323	28.4	61.7	
07 Bed 2 S	503817.1	6964322	28.4	71.1	
07 Bed 1 S	503811.3	6964323	28.4	72.4	
07 Ned 1 W	503809.6	6964325	28.4	74.6	
07 Bed 1 N	503811.6	6964327	28.4	71.5	
07 Living W	503812.5	6964329	28.4	71.8	
08 Dining S	503812	6964330	28.4	72	
08 Dining W	503810.8	6964333	28.4	74.5	
08 Living W	503811.3	6964337	28.4	74.4	
08 Living N	503813.7	6964338	28.4	71.4	
08 Bed 1 W	503814.6	6964338	28.4	71.3	
09 Bed 1 W	503815.4	6964344	28.4	73.2	
09 Bed 1 N	503818	6964346	28.4	70.1	
09 Living W	503819	6964346	28.4	70.7	
09 Living N	503821.7	6964348	28.4	69.7	

**Table B10:** Receiver point calculations, Level 9. Levels are in dB(A) L<sub>10, 18hr</sub> façade-affected.

POINT CALCULATIONS					
Pen3D2000 V 1.9.32					
Project Code:3400					
Project Description:Bowen Rise					
File:Z:\Projects 3400 - 3449\3400 Bowen Rise, Abbotsford Rd, Bowen Hills Residential\Model\3400 CRTN 2025 L9.PEN					
File Description:L9					
Wednesday 18 Nov, 2015 at 11:24:09					
CoRTN Calculations					
All road segments included. Segmentation angle: 10degrees. Road elevations apply.					
Receptor	X Posn	Y Posn	Height	L10(18hour)	
	(m)	(m)	(m)	(dB(A))	
01 Living W	503822.5	6964344	31.3	62	
01 Living N	503825.6	6964347	31.3	62.3	
01 Bed 1 W	503827	6964348	31.3	66.2	
01 Bed 1 N	503829.4	6964350	31.3	68.3	
01 Bed 1 E	503831.1	6964348	31.3	50	
01 Bed 2 N	503831.2	6964347	31.3	49.9	
02 Bed 2 N	503832.9	6964346	31.3	63.3	
02 Bed 1 W	503833.5	6964347	31.3	65.6	
02 Bed 1 N	503835.9	6964349	31.3	67	
02 Bed 1 E	503837.7	6964347	31.3	49.5	
02 Living N	503838.9	6964347	31.3	62.8	
03 Living W	503840.5	6964347	31.3	65.8	
03 Living N	503843	6964348	31.3	64.7	
03 Living E	503845	6964346	31.3	48.7	
03 Bed 1 N	503846.1	6964345	31.3	60.6	
03 Bed 1 E	503847.6	6964342	31.3	48.2	
03 Bed 3 E	503846.8	6964337	31.3	47.8	
03 Bed 2 E	503846.2	6964334	31.3	47.8	
04 Bed 2 E	503845.6	6964330	31.3	48	
04 Bed 1 E	503844.6	6964325	31.3	48.7	
04 Bed 1 S	503842.3	6964323	31.3	55.9	
04 Living E	503840.9	6964321	31.3	49.8	
04 Living S	503838.3	6964320	31.3	67.3	
05 Living S	503834.7	6964322	31.3	64.8	
05 Bed 1 E	503833.3	6964322	31.3	60.4	
05 Bed 1 S	503831.3	6964321	31.3	68.9	
05 Bed 1 W	503829.5	6964323	31.3	67.8	
05 Bed 2 S	503829.4	6964324	31.3	65.9	
06 Bed 2 S	503827.5	6964325	31.3	57.8	
06 Bed 1 E	503827	6964323	31.3	58	
06 Bed 1 S	503824.7	6964322	31.3	69.8	
06 Bed 1 W	503822.8	6964323	31.3	68	
06 Living S	503821.7	6964324	31.3	64.2	
07 Bed 2 E	503820.1	6964323	31.3	61.7	
07 Bed 2 S	503817.1	6964322	31.3	70.8	
07 Bed 1 S	503811.3	6964323	31.3	72.1	
07 Ned 1 W	503809.6	6964325	31.3	74.2	
07 Bed 1 N	503811.6	6964327	31.3	71.3	
07 Living W	503812.7	6964330	31.3	70.8	
07 Bed 1 W	503812.3	6964335	31.3	73.6	

## Appendix C: Building Construction – QDC MP4.4

This Annex is based on the building construction guidelines of ‘Queensland Development Code Mandatory Part 4.4 – Buildings in Transport Noise Corridors’. The Code provides information for new houses, townhouses, units, hotel and motels (Class 1-4 buildings) as well as renovations to relevant Class 1-4 buildings to achieve certain levels of noise mitigation through the use of appropriate materials for floors, walls, roofs, windows and doors for the relevant noise category presented in **Section 4** of this Report.

Under the Department of Local Government and Planning criteria the site is considered to be in the following Categories based on the measured or calculated  $L_{10, 18hr}$  or  $L_{Amax, 24hr}$  value or distance from the road, depending on the property definition given by QDC. The relationships are set out in **Table C1**:

**Table C1:** Noise Categories, related to façade noise levels.

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	$\geq 73$ dB(A)	$\geq 85$ 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	$\leq 57$ dB(A)	$\leq 69$ dB(A)

Note\* the sound levels are measured at 1 metre from the façade.

Performance Requirements	Acceptable Solutions
<b>Residential Buildings</b>	
<p><b>P1</b> <i>Habitable rooms in a relevant residential building are adequately protected from transport noise to safeguard occupants' health and amenity.</i></p>	<p><b>A1</b> The <i>external envelope</i> of each habitable room in a <i>relevant residential building</i> must comply with the minimum <math>R_w</math> for each building component specified in Schedule 1 to achieve a minimum <i>transport noise reduction</i> level for the relevant <i>noise category</i> by:</p> <p>a) Using materials specified in Schedule 2;</p> <p><b>OR</b></p> <p>b) Using materials with <i>manufacturer's specifications</i> that, in combination, achieve the minimum <math>R_w</math> value for the relevant building component and acceptable <i>noise category</i>.</p>

**SCHEDULE 1**

Noise category	Minimum transport noise reduction (dB(A)) required for habitable rooms	Component of building's external envelope	Minimum $R_w$ required for each component
<b>Category 4</b>	40	Glazing	43
		External walls	52
		Roof	45
		Floors	51
		Entry doors	35
<b>Category 3</b>	35	Glazing	38 (where total area of glazing for a habitable room is greater than 1.8m <sup>2</sup> )
			35 (where total area of glazing for a habitable room is less than or equal to 1.8m <sup>2</sup> )
		External walls	47
		Roof	41
		Floors	45
		Entry doors	33

Noise category	Minimum transport noise reduction (dB(A)) required for habitable rooms	Component of building's external envelope	Minimum $R_w$ required for each component
Category 2	30	Glazing	35 (where total area of glazing for a habitable room is greater than 1.8m <sup>2</sup> )
			32 (where total area of glazing for a habitable room is less than or equal to 1.8m <sup>2</sup> )
		External walls	41
		Roof	38
		Floors	45
		Entry doors	33
Category 1	25	Glazing	27 (where total area of glazing for a habitable room is greater than 1.8m <sup>2</sup> )
			24 (where total area of glazing for a habitable room is less than or equal to 1.8m <sup>2</sup> )
		External walls	35
		Roof	35
		Entry doors	28
Category 0	No additional acoustic treatment required – standard building assessment provisions apply		



## SCHEDULE 2

Component of building's external envelope	Minimum $R_w$	Acceptable forms of constructions
Glazing	43	Double glazing consisting of two panes of minimum 5mm thick glass with at least 100mm air gap and full perimeter <i>acoustically rated seals</i> .
	38	Minimum 14.38mm thick laminated glass, with full perimeter <i>acoustically rated seals</i> ;  <b>OR</b> Double glazing consisting of one pane of minimum 5mm thick glass and one pane of minimum 6mm thick glass with at least 44mm air gap, and full perimeter <i>acoustically rated seals</i> .
	35	Minimum 10.38mm thick laminated glass, with full perimeter <i>acoustically rated seals</i> .
	32	Minimum 6.38mm thick laminated glass with full perimeter <i>acoustically rated seals</i> .
	27	Minimum 4mm thick glass with full perimeter <i>acoustically rated seals</i> .
	24	Minimum 4mm thick glass with standard weather seals

Component of building's external envelope	Minimum $R_w$	Acceptable forms of constructions
External walls	52	Two leaves of clay brick masonry, at least 270mm in total, with subfloor vents fitted with noise attenuators
	47	<p>Two leaves of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> <li>(i) Cavity not less than 50mm between leaves; and</li> <li>(ii) 50mm thick mineral insulation or 50mm thick glass wool insulation with a density of 11kg/m<sup>3</sup> or 50mm thick polyester insulation with a density of 20kg/m<sup>3</sup> in the cavity.</li> </ul> <p><b>OR</b></p> <p>Two leaves of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> <li>(i) Cavity not less than 50mm between leaves; and</li> <li>(ii) At least 13mm thick cement render on each face.</li> </ul> <p><b>OR</b></p> <p>Single leaf of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> <li>(i) A row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and</li> <li>(ii) Mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11kg/m<sup>3</sup> positioned between studs; and</li> <li>(iii) One layer of plasterboard at least 13mm thick fixed to outside face of studs.</li> </ul> <p><b>OR</b></p> <p>Single leaf of minimum 150mm thick masonry of hollow, dense concrete blocks, with mortar joints laid to prevent moisture bridging.</p>

Component of building's external envelope	Minimum $R_w$	Acceptable forms of constructions
External walls	41	<p>Two leaves of clay brick masonry at least 110mm thick with cavity not less than 50mm between leaves</p> <p><b>OR</b></p> <p>Single leaf of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> <li>(i) A row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and</li> <li>(ii) Mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11kg/m<sup>3</sup> positioned between studs; and</li> <li>(ii) One layer of plasterboard at least 10mm thick fixed to outside face of studs.</li> </ul> <p><b>OR</b></p> <p>Single leaf of brick masonry at least 110mm thick with at least 13mm thick render on each face</p> <p><b>OR</b></p> <p>Concrete brickwork at least 110mm thick</p> <p><b>OR</b></p> <p>In-situ concrete at least 100mm thick</p> <p><b>OR</b></p> <p>Precast concrete at least 100mm thick and without joints.</p>
	35	<p>Single leaf of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> <li>(i) A row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and</li> <li>(ii) One layer of plasterboard at least 10mm thick fixed to the outside face of studs</li> </ul> <p><b>OR</b></p> <p>Minimum 6mm thick fibre cement sheeting or weatherboards or plank cladding externally, minimum 90mm deep timber stud or 92mm metal stud, standard plasterboard at least 13mm thick internally.</p>

Component of building's external envelope	Minimum $R_w$	Acceptable forms of constructions
<b>Roof</b>	45	<p>Concrete or terracotta tile or sheet metal roof with sarking, <i>acoustically rated plasterboard</i> ceiling at least 13mm thick fixed to ceiling joists, cellulose fibre insulation at least 100mm thick with a density of at least 45kg/m<sup>3</sup> in the cavity</p> <p><b>OR</b></p> <p>Concrete or terracotta tile or sheet metal roof with sarking, 2 layers of <i>acoustically rated plasterboard</i> at least 16mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m<sup>3</sup> or polyester insulation at least 50mm thick with a density of at least 20kg/m<sup>3</sup> in the cavity.</p>
	41	<p>Concrete or terracotta tile or sheet metal roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m<sup>3</sup> or polyester insulation at least 50mm thick with a density of at least 20kg/m<sup>3</sup> in the cavity</p> <p><b>OR</b></p> <p>Concrete suspended slab at least 100mm thick.</p>
	38	<p>Concrete or terracotta tile or sheet metal roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity, mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11kg/m<sup>3</sup></p>
	35	<p>Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity</p>
<b>Floors</b>	51	<p>Concrete slab at least 150mm thick</p>
	45	<p>Concrete slab at least 100mm thick</p> <p><b>OR</b></p> <p>Tongued and grooved boards at least 19mm thick with:</p> <ul style="list-style-type: none"> <li>(i) Timber joists not less than 175mm x 50mm; and</li> <li>(ii) Mineral insulation or glass wool insulation at least 75mm thick with a density of at least 11kg/m<sup>3</sup> positioned between joists and laid on plasterboard at least 10mm thick fixed to underside of joists; and</li> <li>(iii) Mineral insulation or glass wool insulation at least 25mm thick with a density of at least 11kg/m<sup>3</sup> laid over entire floor, including tops of joists before flooring is laid; and</li> <li>(iv) Secured to battens at least 75mm x 50mm; and</li> <li>(v) The assembled flooring laid over the joists, but not fixed to them, with battens lying between the joists.</li> </ul>

Component of building's external envelope	Minimum $R_w$	Acceptable forms of constructions
<b>Entry Doors</b>	35	Solid core timber not less than 45mm thick, fixed so as to overlap the frame or rebate of the frame by not less than 10mm, with full perimeter <i>acoustically rated seals</i> .
	33	Fixed so as to overlap the frame or rebate of the frame by not less than 10mm, fitted with full perimeter <i>acoustically rated seals</i> and constructed of: <ul style="list-style-type: none"> <li>(i) Solid core wood, particleboard or blockboard not less than 45mm thick; and/or</li> <li>(ii) Acoustically laminated glass not less than 10.38mm thick</li> </ul>
	28	Fixed so as to overlap the frame or rebate of the frame, constructed of: <ul style="list-style-type: none"> <li>(i) Wood, particleboard or blockboard not less than 33mm thick; or</li> <li>(ii) Compressed fibre reinforced sheeting not less than 9mm thick; or</li> <li>(iii) Other suitable material with a mass per unit area not less than 24.4kg/m<sup>2</sup>, or</li> <li>(iv) Solid core timber door not less than 35mm thick fitted with full perimeter <i>acoustically rated seals</i>.</li> </ul>

## Appendix D: Statement of Qualifications

---

**The Signatory to this Report is Qualified under the Australian Qualifications Framework at Level 8 (Post-Graduate) in**

**Monitoring and Evaluating Noise and Noise Management:**

Mr Max Thorne, LLB (Otago), Principal NMS

Mr Josh Dyer, B.Env.Tech (Griffith), Senior Acoustician NMS

Mr Matt Dever, B.Audio (SAE), Senior Acoustician NMS

Mr Matt Fishburn, B.E., RPEQ, Reviewer

Mr Geoff Renison, Acoustician NMS

**NMS Specific Project Reviewer**

Dr Bob Thorne PhD, FRSPH, MIOA, MAAS

**Projects and Studies by NMS**

- Assessment of transportation noise to QDC MP4.4 and Queensland State Development guidelines
- Assessment of noise from light industry onto noise sensitive places
- Assessment of quarry noise on residential neighbours
- Mine site, blasting and drilling assessments
- Environmental noise impact assessment and prediction modeling for residential estates and residential developments
- Traffic noise impact assessments for residential developments
- Remote telemetry systems for noise monitoring
- Industrial noise impact assessments and associated noise management plans
- Occupational noise assessment
- Industrial surveys for noise exposure and noise management
- The effects of noise from patrons and music on residential neighbours
- Building acoustics (in association with Alpha Acoustics)
- Vehicle noise compliance (ADR)
- Research investigations into the effects of various noise sources on sensitive and non-sensitive communities



## Appendix E: Glossary

---

### ***Event maximum sound pressure level (LA%,adj,T), L01***

The L01 level is calculated as the noise level equalled and exceeded for 1% of the measurement time, for example 9 seconds in any 15 minute interval. L01 is an appropriate level to characterise single events, such as from train bypass.

In this Report, the measured L01 levels for day/evening/night are not averaged but are arranged from low to high in the relevant day/evening/night interval and the value that is found at the 90th percentile (L10 of L01 sample) in the interval is recorded as its "L01" level.

### ***Average maximum sound pressure level (LA%,adj, T), L10***

The "L10" level is an indicator of "steady-state" noise or intrusive noise conditions from traffic, music and other relatively non-impulsive noise sources. The L10 level is calculated as the noise level equalled and exceeded for 10% the measurement time, for example 90 seconds in any 15 minute interval. The measured L10 time-intervals for day/evening/night are arithmetically averaged to present the "average maximum" levels of the environment for day/evening/night. The level can be adjusted for tonality or impulsiveness.

### ***Background sound pressure level (LA90,T), L90***

Commonly called the "L90" or "background" level and is an indicator of the quietest times of day, evening or night. The L90 level is calculated as the noise level equalled and exceeded for 90% the measurement time. The measured L90 time-intervals are arithmetically averaged to present the "average background" levels of the environment for day/evening/night. The level is recorded in the absence of any noise under investigation. The level is not adjusted for tonality or impulsiveness.

### ***Equivalent Continuous or time average sound pressure level (LAeq,T), Leq***

Commonly called the "Leq" level it is the logarithmic average noise level from all sources far and near. The maximum 1-hour levels within the day/evening/night time intervals are referenced for building design. The level can be adjusted for tonality.

### ***Façade-adjusted level***

A sound level that is measured at a distance of 1.0 metre from a wall or facade. The level is nominally 2.5 dB higher than the free-field level.

### ***Free-field level***

A sound level that is measured at a distance of more than 3.5 metres from a wall or facade.

### ***Weighted Sound Reduction Index, Rw***

A single number value used to compare the sound reduction index of building elements. Similar to the Sound Transmission Class (STC) rating that is still in common use. Rw and STC are not identical though may be considered, for most applications, as being interchangeable. A high Rw indicates high sound reduction.