

14 March 2016

Ross McDowell  
Harrison Grierson  
PO Box 1199  
TAURANGA 3140

Dear Ross

### **THE LAKES – STAGE 2UV**

Thank you for the information on stage 2UV of The Lakes development in Tauranga. The development consists of a residential subdivision adjacent to Takitimu Drive (SH36), comprising of Lots 1 - 109. Figure 1 shows the proposal. As requested I have considered the mitigation required to control traffic noise to the proposed subdivision.

Rule 4E.2.5 of the District Plan provides criteria for new dwellings that are constructed next to busy roads. Strictly speaking, this rule relates to the person developing the residence rather than the subdivision. However, all stages of The Lakes development have been designed to control road traffic noise to the subdivision, with the later stages all adopting the District Plan rule. For consistency, Stage 2UV has also been designed for road traffic noise through the adoption of the District Plan rule, part a) which requires:

*For properties within the NZTA (New Zealand Transport Agency) Reverse Sensitivity Plan Area shown on the Plan Maps (Part B):*

- i) Any new dwelling shall meet an internal road-traffic design sound level of 40dB  $L_{Aeq(24h)}$  inside all habitable rooms with ventilating windows open.*

This report provides a method by which noise from road traffic on SH36 will be controlled to within the 40dB  $L_{Aeq(24h)}$  requirement of the District Plan to habitable rooms whilst the rooms are being adequately ventilated.

### **Road Noise**

Noise from road traffic has been predicted to the subdivision using the Predictor noise prediction program. Predictor uses the electronic files of the alignment and surrounding topography to build a full scale model of the road and adjacent sites. As there are no houses in the area currently being assessed, the analysis has been based on the most exposed facade of future houses being 2m from the site boundary facing the road, which is typical of the houses that have already been constructed further north along Takitimu Drive.

Traffic noise has been predicted based on the understanding that the road has a medium grade chip seal surface. It is understood the traffic flow on SH36 adjacent to Stage 2UV of The Lakes will be 15,337 vehicles per day north of the roundabout with 5540 vehicles per day to the south. There will be 5% heavy commercial vehicles and a posted speed of 100km/hr.

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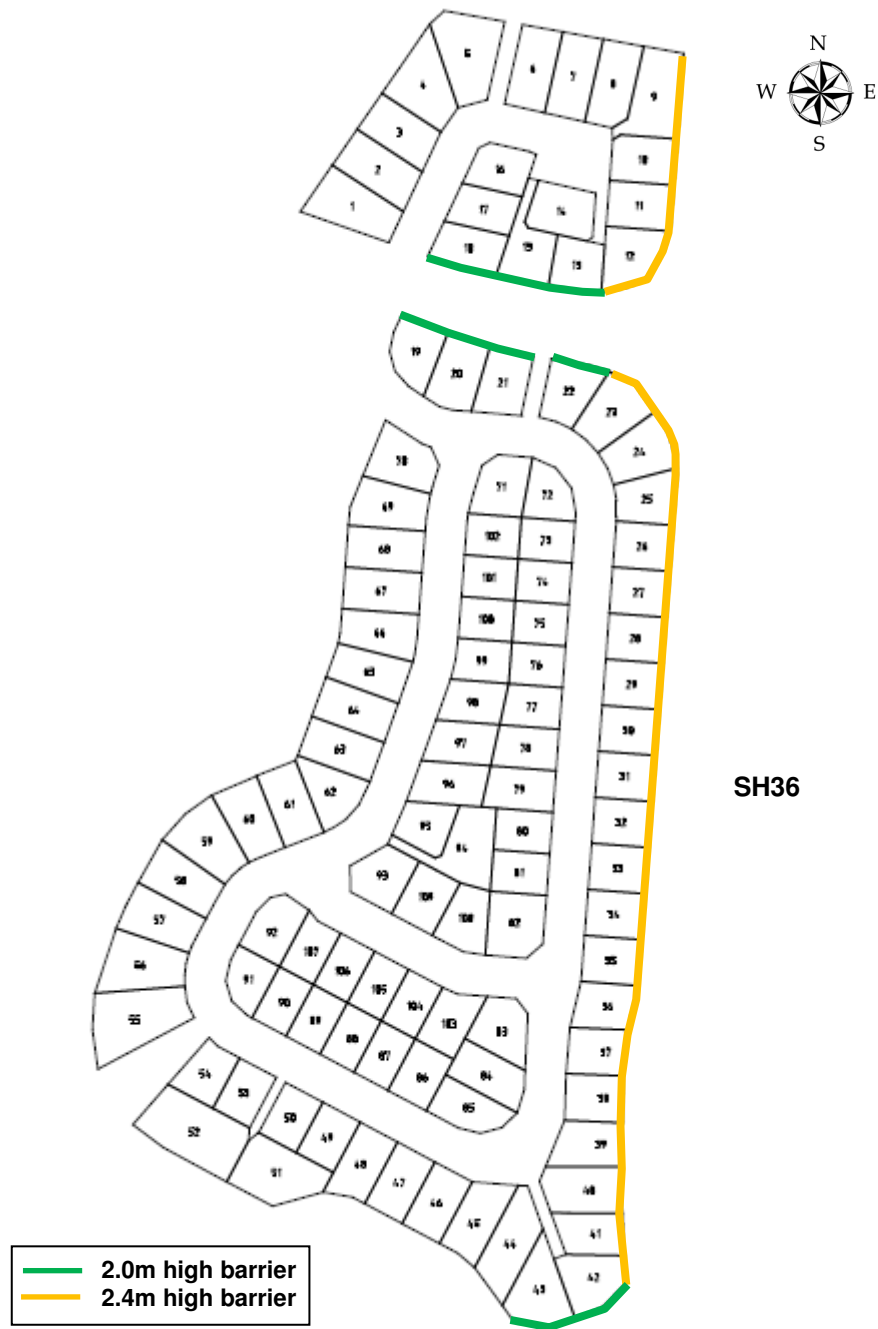


Figure 1. Stage 2UV Site Plan

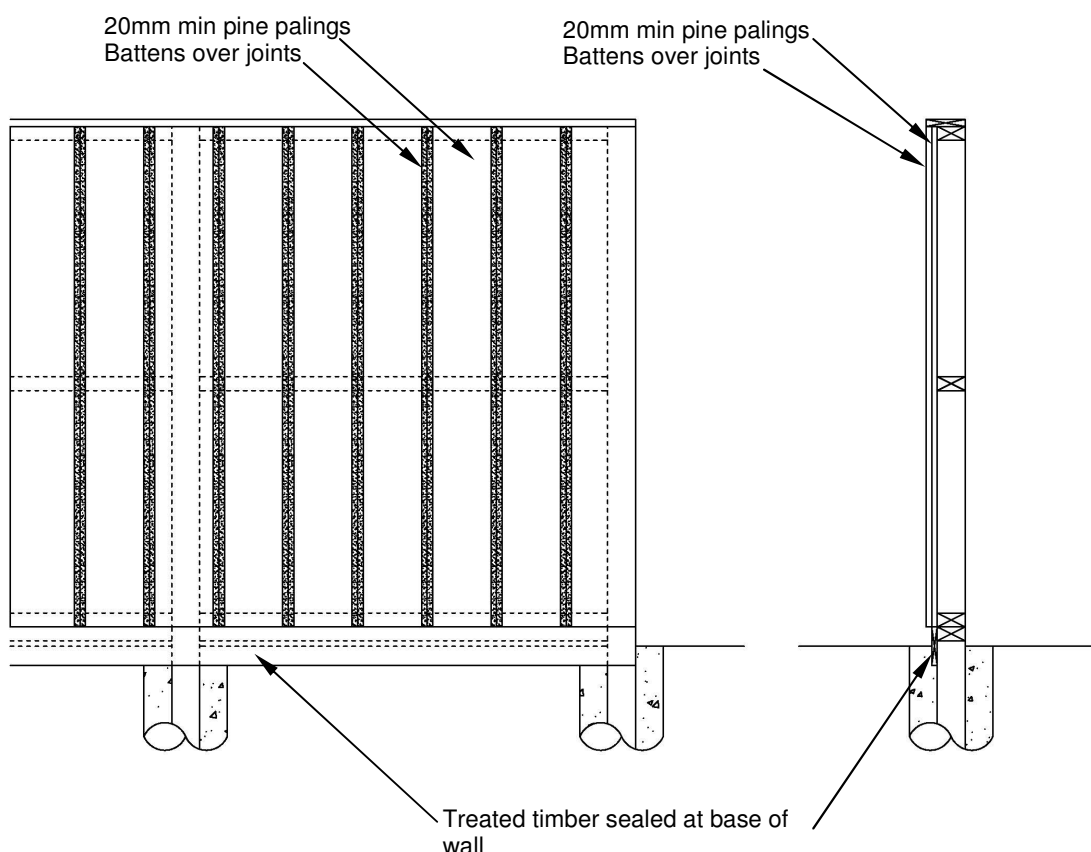
**Mitigation**

The analysis began by considering the practicability of noise barriers to control the internal levels to within the 40dB  $L_{Aeq(24h)}$  criterion. This approach is based on a façade with a top hung window that is open for ventilation providing a 15dB reduction. This being the case, to achieve 40dB internally the level at the most exposed facade must be controlled to within 55dB  $L_{Aeq(24h)}$ . As the dwellings are yet to be constructed, it has been assumed they may be of two storey construction. This is an

important consideration, as increasing the receiver heights will have an effect on the height of the barriers.

Analysis showed that a 2.4m high barrier on the common site boundary with SH36, that returns up the internal access road with a 2.0m barrier for approximately 90m across the southern end of Stage 2UV, would achieve a façade level of 55dB  $L_{Aeq(24h)}$  or below to the ground floor of the majority of the dwellings. This barrier is shown on Figure 1. To achieve 55dB to the remainder of the ground floors would require barriers well in excess of 2.4m with higher barriers again to achieve 55dB to all upper floor receivers. The conclusion was therefore that while it was practicable to screen some ground floors, it was not practicable to use barriers to achieve the internal design criterion in all situations. This finding is common to most of the other Stages of The Lakes development where the approach taken by the design team to achieve the required internal noise level was to use barriers where practicable and attenuation provided by the building façade for the remaining dwellings.

The barrier could be constructed as a wall, a bund or a combination of each. If the wall option is selected the wall must be constructed from a material with a surface density of  $10\text{kg/m}^2$  or greater. Suitable materials consist of 20mm pine palings, 9mm fibre cement sheet or 20mm plywood. Concrete and masonry are also suitable. There must be no untreated openings in the wall, including at the base and if timber palings are used, they must be butted together with battens placed over the joints to control openings forming as the palings dry and shrink. Suitable construction details are shown on Figure 2 below.



**Figure 2. Suitable Timber Wall Detail**

With the barriers in place, the predicted road traffic levels are shown in Table 1.

Table 1. Summary of Façade Traffic Noise Levels with Barrier Mitigation

Lot	Façade Noise Levels (dB L <sub>Aeq(24hr)</sub> )		Lot	Façade Noise Levels (dB L <sub>Aeq(24hr)</sub> )	
	Ground Floor	First Floor		Ground Floor	First Floor
1	56	57	37	55	66
2	57	57	38	53	63
3	58	58	39	52	62
4	58	59	40	54	64
5	60	60	41	52	61
6	60	61	42	52	62
7	61	62	43	51	59
8	61	63	44	49	54
9	60	67	45	48	52
10	59	67	46	47	50
11	58	67	47	47	49
12	58	66	48	47	49
13	57	62	49	46	48
14	58	60	50	46	48
15	57	60	51	46	48
16	58	59	52	45	47
17	58	58	53	46	47
18	57	58	54	46	47
19	52	57	55	46	47
20	54	58	56	47	48
21	54	58	57	47	48
22	54	62	58	47	48
23	55	64	59	47	49
24	55	63	60	47	49
25	54	64	61	48	49
26	54	63	62	48	50
27	54	63	63	48	50
28	54	63	64	48	51
29	54	64	65	49	51
30	54	63	66	49	52
31	54	64	67	49	52
32	54	64	68	49	53
33	54	64	69	50	53
34	53	63	70	50	53
35	55	66	71	51	55
36	55	66	72	51	55
73	51	55	92	47	48

Lot	Façade Noise Levels (dB L <sub>Aeq(24hr)</sub> )		Lot	Façade Noise Levels (dB L <sub>Aeq(24hr)</sub> )	
	Ground Floor	First Floor		Ground Floor	First Floor
74	50	54	93	48	50
75	50	53	94	48	51
76	50	53	95	48	50
77	50	53	96	48	51
78	49	52	97	49	51
79	49	52	98	49	52
80	49	52	99	49	52
81	49	52	100	50	53
82	49	51	101	50	53
83	48	51	102	50	54
84	48	51	103	48	50
85	48	51	104	48	50
86	48	50	105	47	50
87	47	49	106	47	49
88	47	49	107	47	49
89	47	49	108	48	50
90	46	48	109	48	50
91	46	48			

	<=	55dB L <sub>Aeq(24hour)</sub>
	>	55dB L <sub>Aeq(24hour)</sub>

Table 1 shows that the predicted facade levels would exceed the 55dB L<sub>Aeq(24hour)</sub> criterion for:

- ground floor dwellings on Lots 1 to 18; and
- Any upper level constructed on Lots 1 – 43.

For dwellings on these Lots it is proposed that façade mitigation be used to control internal levels of noise to within the required 40dB L<sub>Aeq(24hour)</sub>. This mitigation is discussed in the following section.

It should be noted that while not a requirement of the District Plan, the façade mitigation will do nothing to control the external noise levels in any outdoor amenity areas.

### Façade Mitigation

Table 1 shows that the maximum level of noise that any dwelling can expect is 67dB L<sub>Aeq(24hr)</sub> (the upper floors of Lots 9 - 11). These facades must be capable of a reduction of at least 27dB to achieve the required internal level of 40dB L<sub>Aeq(24hr)</sub>.

To demonstrate that it is practicable to achieve this reduction, conventional façade construction has been investigated.

Double glazing consisting of 6mm float glass, a 12mm cavity and a further layer of 4mm float glass will provide approximately 29dB reduction, depending upon its size, when closed and is therefore suitable. A standard roof construction consisting of 0.4mm profiled metal cladding, blanket and a 10mm Gib Board ceiling will provide in excess of a 30dB reduction. Timber framed walls with a brick cladding, cavity absorption and a 10mm Gib Board lining will provide well in excess of the necessary reductions. From the above constructions, it can be seen that typical forms of construction can achieve the required reductions meaning that there are ample construction options available that will meet the District Plan criterion.

### Proposed Conditions

A suitable condition for the subdivision that would ensure the barrier adopted by this assessment is included could read:

*Noise walls shall be constructed along the eastern site boundary to screen the Lots from road traffic noise. The barriers shall range in height from 2.0 – 2.4m and be constructed in the location described by Figure 1 of the letter by Hegley Acoustic Consultants to Harrison Grierson dated 20 November 2015. The noise walls will be constructed from a material with a surface density of 10kg/m<sup>2</sup> or greater. There must be no untreated openings in the wall, including at its base and if timber palings are used, they must be butted together with battens placed over the joints to control openings forming as the palings dry and shrink.*

To ensure the appropriate houses are designed to control traffic noise to all floors where barriers are not practical, the following condition could be placed on the titles of Lots 1 - 18:

*Any dwelling shall meet an internal road-traffic design sound level of 40dB L<sub>Aeq(24h)</sub> inside all habitable rooms with ventilating windows open. Where windows must remain closed to achieve the required internal noise level, alternative ventilation must be supplied that provides ventilation in accordance with the building code. Noise from the ventilation system must not exceed 35dB L<sub>Aeq(30s)</sub> when measured 1 metre from any grille or diffuser.*

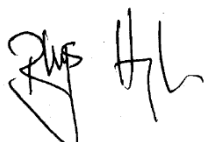
To ensure the appropriate houses are designed to control traffic noise to the upper floor only where barriers are not practical, the following condition could be placed on the titles of Lots 19 - 43:

*The first floor of any dwelling shall meet an internal road-traffic design sound level of 40dB L<sub>Aeq(24h)</sub> inside all habitable rooms with ventilating windows open. Where windows must remain closed to achieve the required internal noise level, alternative ventilation must be supplied that provides ventilation in accordance with the building code. Noise from the ventilation system must not exceed 35dB L<sub>Aeq(30s)</sub> when measured 1 metre from any grille or diffuser.*

I note that previous conditions for other Stages of The Lakes development provided additional requirements for the ventilation system. While these appear sensible I have not commented on them as they are outside of my area of expertise. It may, however, be reasonable to include these ventilation requirements in any final condition.

Should you have any questions regarding the above please do not hesitate to contact me.

Yours sincerely  
Hegley Acoustic Consultants



Rhys Hegley



12 June, 2018

The Lakes Tauranga  
c/- Harrison Grierson Consultants Ltd  
PO Box 13025  
Tauranga 3141

**Attention: Simon Maxwell/ David Needham**

Dear Sir

**Re: The Lakes Stage 2UV, Foley Grove,  
Noise Control Treatment to Dwellings**

As requested, we have carried out an assessment of the noise control treatment required to the dwellings constructed within Foley Grove, which is within Stage 2UV of 'The Lakes' residential development.

Our findings and recommendations are set out below.

## **1.0 Background Information**

In relation to the development of the Stage 2UV subdivision and the control of noise from the neighbouring State Highway 36 (Takitimu Drive):

- The subdivision is protected from noise from vehicles on the Highway, to help avoid a 'reverse sensitivity' issue arising. This is achieved by the construction of a 2.4m high noise barrier on the eastern side of the Stage 2UV subdivision. The barrier is reduced in height to 2.0m high at the northern and southern ends.
- The noise modelling and details of the barrier were set out in the report from Hegley Acoustic Consultants, dated 12 May 2017.
- The requirements of Rule 4E.2.5 of the Operative Tauranga City Plan were adopted for the Hegley assessment. This Rule specifies that:

*For properties within the NZTA (New Zealand Transport Agency) Reverse Sensitivity Plan Area shown on the Plan Maps (Part B):*

- i) *Any new dwelling shall meet an internal road-traffic design sound level of 40dB LAeq(24h) inside all habitable rooms with ventilating windows open.*
- For most Lots, the noise barrier was designed to mitigate noise from the State Highway to 55 dBA Leq24hr or less outside the facades of the dwelling, in which case no further acoustic treatment is required. This is because research has shown that a typical outdoor-to-indoor noise reduction of 15 dBA is achieved with windows open ajar for natural ventilation.

- The Hegley report showed that this may not be achievable for the upper level of two storey dwellings built near to the Highway, since the upper level will 'overlook' the noise barrier and the noise level will exceed 55 dBA Leq24hr. Any barrier would need to be excessively high to achieve 55 dBA at the upper level. On this basis, an acoustic design is required for dwellings on these Lots, which will set out the noise control treatment that is required to the 'building envelope' of the dwelling. The treatment would be designed to achieve 40 dBA within bedrooms and other 'habitable rooms' within the dwelling.
- The Hegley report also identified that some single storey dwellings on Lots within Foley Grove (or lower level of two-storey dwellings) may also have difficulty complying with the requirement.
- The Rule of the City Plan specifies that if compliance with the internal noise limit can only be achieved with windows/external doors to the habitable room closed, then an alternative means of ventilation is required ie. a mechanical ventilation or air conditioning system.

We have visited the subject site and carried out noise measurements across the Foley Grove subdivision. With this information, we have assessed the likely noise control treatment to dwellings, to satisfy the City Plan Rule.

## **2.0 Noise Control Treatment**

The attached guidelines are provided to assist with the design of dwellings on the Foley Grove Lots. Potential owners/developers of these Lots can determine the likely cost impact (if any) at an early stage and design the building appropriately. Note that no treatment is required to single storey dwellings on the western side of Foley Grove, on Lots 1-11 and 29-32 (Area A). Two storey dwellings on these Lots do not require upgrades except that a mechanical ventilation system may be required to the upper floor. An acoustic certificate is not required for dwellings within Area A, however a design/producer statement in relation to ventilation is recommended.

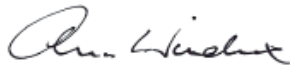
Lots 12-28 (Area B) are on the eastern side and closer to the Highway, and although single storey dwellings on these Lots do not require treatment to the building envelope, they may require a mechanical ventilation system. An acoustic certificate is not required for single storey dwellings on these Lots, however a design/producer statement in relation to ventilation is recommended.



Two-storey dwellings within Area B will require upgrades to the building envelope, but only on the upper floor. If the attached recommendations are incorporated, our assessment shows that the internal noise level criterion will be achieved. An acoustic design certificate is recommended for any two storey dwelling on these Lots, where the building consent drawings can be checked and an acoustic certificate provided by a suitably qualified and experienced acoustic consultant. A design/producer statement in relation to ventilation is also recommended for dwellings on these Lots.

We trust this information is satisfactory. Please do not hesitate to contact us if you have any questions.

Yours faithfully,  
**Design Acoustics Ltd**

A handwritten signature in black ink, appearing to read 'Tony Windner', written in a cursive style.

Tony Windner,  
Director

**Foley Grove Subdivision, Lots 1 to 32, DP 518298**  
**Noise Control Treatment**

## **1.0 Introduction**

The following guideline recommendations should be implemented, so that the acoustic requirements of the City Plan are achieved. In general, the requirement is that the noise level inside habitable rooms within the dwelling, due to traffic on the adjoining State Highway, shall not exceed 40 dBA Leq24hr.

Note that the following applies to **habitable rooms only**. A 'habitable room' includes bedrooms, an office, living, study area, and not to any other service or transit area (eg. bathrooms, laundry, garage, corridor etc).

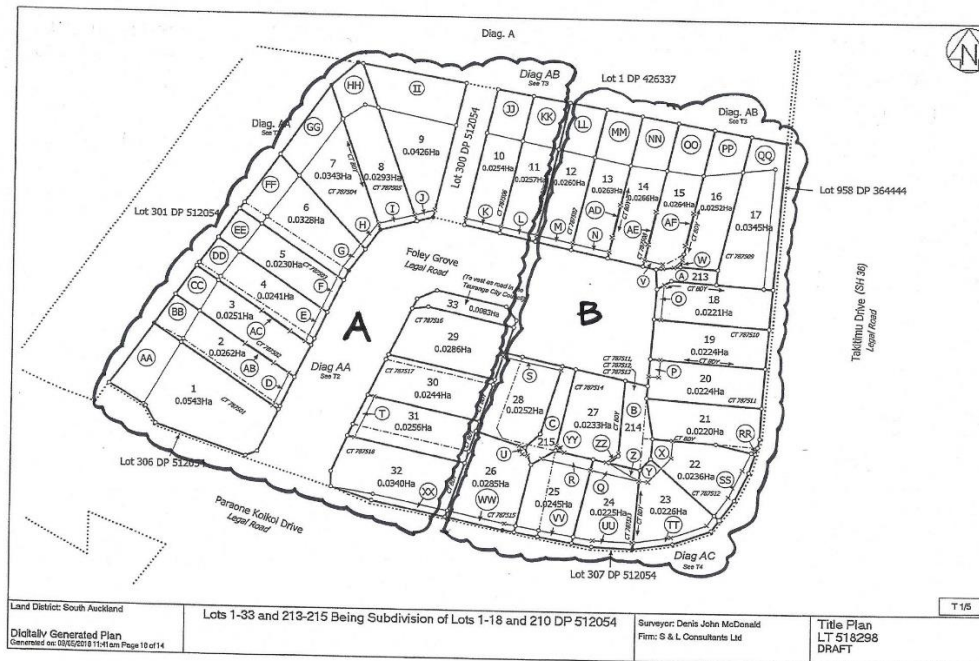
## **2.0 Assessment**

The noise level inside habitable rooms depends on many factors. These include the external noise level and spectral/frequency content (varies throughout the day and night), the effect of any fence/barrier on the boundary, the types of building materials, the room layout, areas of walls, windows and doors, volume of rooms and the amount/type of sound absorbing materials inside the room (furnishings, drapes etc).

We have carried out an assessment of the noise control treatment required to achieve the internal noise criterion. Our assessment of the noise control treatment has included our best engineering estimates of the many variables associated with calculation of noise inside buildings.

### 3.0 Noise Control Recommendations

The degree of noise control treatment to dwellings depends on its location within **Area A** and **Area B** as shown below:



#### 3.1 Area A

The following applies to habitable rooms of dwellings on:

Lots 1 to 11

Lots 29 to 32

These Lots are located on the western side of the development.

##### 3.1.1 Single-storey dwellings

Single storey dwellings on these Lots do not require any specific noise control treatment to the 'building envelope' nor is a mechanical ventilation system required. On this basis, an acoustic design certificate is **not** required.

### **3.1.2 Two-storey Dwellings**

In relation to two-storey dwellings on these Lots, no treatment to the 'building envelope' is required.

In relation to mechanical ventilation:

- A system is not required to habitable rooms on the lower floor.
- A mechanical ventilation system may be required to habitable rooms on the upper floor of any two-storey dwelling on these Lots. This shall apply to habitable rooms with openable external windows/doors on the upper floor, which face north, east or south.

Habitable rooms on the upper floor of these Lots, with a window/door facing west (away from the Highway) will not require a mechanical ventilation system, as long as window/door openings for natural ventilation are located on the western side of the habitable room, and this window/door provides ventilation in accordance with the City Plan Rule/NZ Building Code section G4. (See Table 1 attached).

An acoustic design certificate is **not** required for dwellings within Area A, however, a producer statement may be required in relation to the provision of a mechanical ventilation system for the upper floor of two-storey dwellings.

## **3.2 Area B**

The following applies to habitable rooms of dwellings on:

Lots 12-28

These Lots are located on the eastern side of the development, near to the Highway.

### **3.2.1 Single-storey dwellings**

Habitable rooms of dwellings in this category do not require any specific noise control treatment to the building envelope.

However, a mechanical ventilation system may be required to habitable rooms on these Lots. This shall apply to habitable rooms with openable external windows/doors which face north, east or south.

Habitable rooms, with a window/door facing west (away from the Highway) will not require a mechanical ventilation system, as long as window/door openings for natural ventilation are located on the western side of the habitable room, and this window/door achieves sufficient ventilation/openable area in accordance with the City Plan Rule/NZ Building Code section G4. (See Table 1 attached).

An acoustic design certificate is **not** required for single storey dwellings within Area B, however a producer statement may be required in relation to the provision of a mechanical ventilation system.

### **3.2.2 Two-storey dwellings**

#### **Lower floor**

Habitable rooms on the lower floor of dwellings in this category do not require any specific noise control treatment to the 'building envelope'.

However, a mechanical ventilation system may be required to habitable rooms on these Lots. This shall apply to habitable rooms with openable external windows/doors which face north, east or south.

Habitable rooms, with a window/door facing west (away from the Highway) will not require a mechanical ventilation system, as long as window/door openings for natural ventilation are located on the western side of the habitable room, and this window/door achieves sufficient ventilation/openable area in accordance with the City Plan Rule/NZ Building Code section G4. (See Table 1 attached).

#### **Upper Floor**

Habitable rooms on the upper floor of two-storey dwellings, which have external facades which face north, east or south shall be checked for compliance with the following recommendations/noise control treatment.

Constructions (a) (b) (c) etc. are cross-referenced to the sketch details on the attached Figure 1.

All habitable rooms on the upper floor will require a mechanical ventilation system in accordance with the City Plan Rule. (See Table 1 attached).

For two storey dwellings on these lots, an acoustic design certificate, if required by Tauranga City Council, shall be submitted. The certificate shall be prepared by a suitably qualified and experienced acoustic consultant.

A producer statement may be required in relation to the provision of a mechanical ventilation system.

**Table 1**

**Noise Control Treatment/Ventilation to Habitable rooms on the Upper Level of Two-storey dwellings on Lots 12-28 (Area B).**

The following Table 1 applies to habitable rooms on the upper level of two storey dwellings on these Lots within Area B, with facades of the room which face north, east or south.

**Table 1**

<b>Roof/ceiling Assemblies</b>	<b>External construction</b>	<b>Internal construction</b>	<b>Notes</b>
Habitable room with pitched/trussed roof	Roof: (a) Concrete, clay or metal tiles or 0.55 mm corrugated steel over timber battens.  OR Sheet membrane or bituminous tiles on 12.5mm plywood sarking	Ceiling: (c) 1 layer 13mm Gib Ultraline fixed to underside of trusses with timber or steel battens.  (e) Minimum R3.2 Batts to ceiling cavity	See Figure 1. Recessed light fittings in ceiling to be IC rated (approved insulation can be located on back of fitting) or use surface mounted fittings only.
Bedroom or habitable room with skillion roof/raking ceiling	Roof: (b) Concrete, clay or metal tiles or 0.55 mm corrugated steel, or sheet membrane on 12.5mm plywood sarking.  OR Bituminous tiles on 17.5mm plywood sarking	Ceiling: (d) 1 layer 13mm Gib Noiseline fixed to underside of rafters, fixed with Rondo or USG clip plus batten system.  (e) Minimum R3.2 Batts to ceiling cavity	See Figure 1. Recessed light fittings in ceiling to be IC rated (approved insulation can be located on back of fitting) or use surface mounted fittings only.

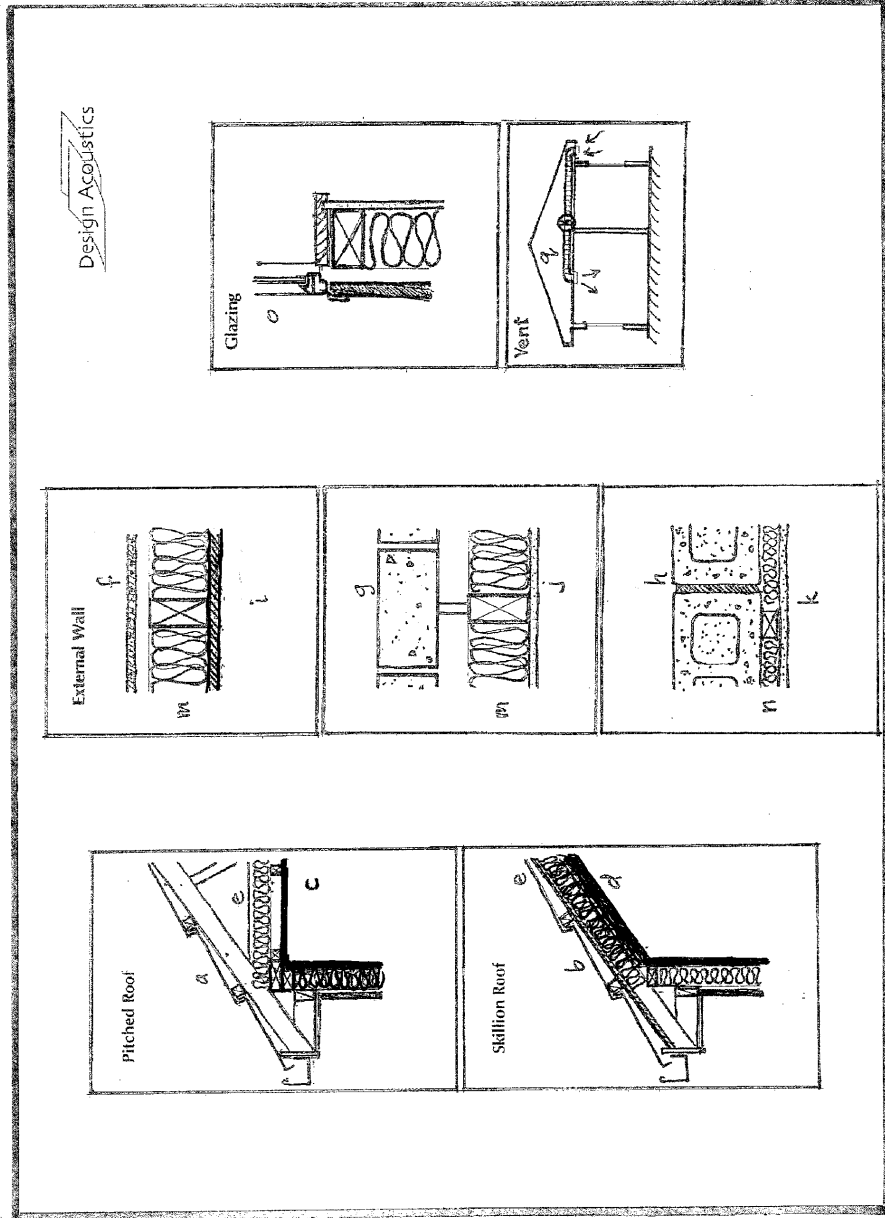
**Table 1 continued**

<b>External Walls</b>	<b>External construction</b>	<b>Internal construction</b>	<b>Notes</b>
Timber (or steel) framed construction of Habitable room (external) Walls facing north, east, or south	External cladding: (f) Sheet cladding system with minimum surface weight of 9 kg/m <sup>2</sup> eg. Aerated concrete panels, Hardies Linea/ Oblique/ Stria weatherboards or 7.5mm Monotek, Hardieflex, Axon sheets, 17mm Ecoply, 19mm radiata pine weatherboards.	Internal lining: (i) 1 layer 13mm Gib Noiseline  (m) Minimum R2.2 Batts to cavity	See Figure 1.
	(g) clay or concrete brick veneer cladding, minimum 175 kg/m <sup>2</sup>	(j) 1 layer 10mm Standard Gib  (m) Minimum R2.2 Batts to cavity	See Figure 1
Masonry Construction of Bedroom or habitable room (external) Walls facing north, east or south	(h) 140-190mm wide concrete block, cavities filled 100% with grout	(k) Minimum 20mm thick strapping with 1 layer 10 or 13 mm standard Gib lining.  (n) 20mm thick insulation to cavity (eg. Pink Batts Masonry Batts).	See Figure 1
<b>Windows / Doors</b>			
To eastern wall of habitable rooms (facing Highway)	(o) Dual (IGU) glazing including one pane which is minimum 6.38mm mm thick laminated glass. The other pane of glass may be ordinary float glass. Maximum area of window 25% of external wall area	N/a	No doors to habitable rooms on eastern façade. No vents in joinery system. All glazing with good gaskets to seal "airtight". Comply with NZS4223 and thermal requirements. See Figure 1
Northern or southern (external) walls of habitable rooms	(o) Dual (IGU) glazing, to satisfy other requirements, using standard float glass but with one pane minimum 6mm thick. Maximum area of window/door 25% of external wall area	N/a	No vents in joinery system. All glazing with good gaskets to seal "airtight". Comply with NZS4223 and thermal requirements

**Table 1 continued**

<b>Ventilation System</b>	<b>Requirement</b>	<b>Notes</b>
Habitable rooms	<p>A ventilation system shall be installed comprising the following components and specifications:</p> <p>(a) An air conditioning system provided that the noise level generated by the system does not exceed 35 dB LAeq30secs in bedrooms and 40 dB LAeq30secs in all other habitable rooms, when measured 1 metre away from any grille or diffuser,</p> <p>OR</p> <p>(b)</p> <ul style="list-style-type: none"> <li>▪ A mechanical ventilation system providing at least 15 air changes/hr in living/dining areas, and at least 5 air changes/hr in all other habitable rooms, and;</li> <li>▪ Noise must not exceed 40 dB LAeq30secs in the living/dining area, and 35 dB LAeq in all other habitable rooms when measured 1m from any grille or diffuser, and;</li> <li>▪ Internal air pressure must be no more than 10Pa above ambient air pressure due to the mechanical ventilation, and;</li> <li>▪ Where a high air flow rate setting is provided, the system must be controllable by the occupants to be able to alter the ventilation rate with at least three progressive stages (ie. low/medium/high speed).</li> </ul>	<p>See Figure 1 detail (q).</p> <p>Option (a) may be achieved by ducted air conditioning unit with fresh air supplement. Minimum ventilation requirements of Section G4 of the NZ Building Code shall apply.</p> <p>Option (b) may be achieved by a 'low-noise' or acoustically treated supply fan in ceiling cavity, with minimum 1.5 metres of acoustic flexible duct on each side of the fan. Split system heat pumps are desirable for thermal control.</p> <p>A mechanical ventilation system may not be required if the habitable room has a west-facing window/s, with openable area at least 5% of the room's floor area and/or complies with Section G4 of the NZ Building Code.</p>





**Figure 1**