

14 March 2016

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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.

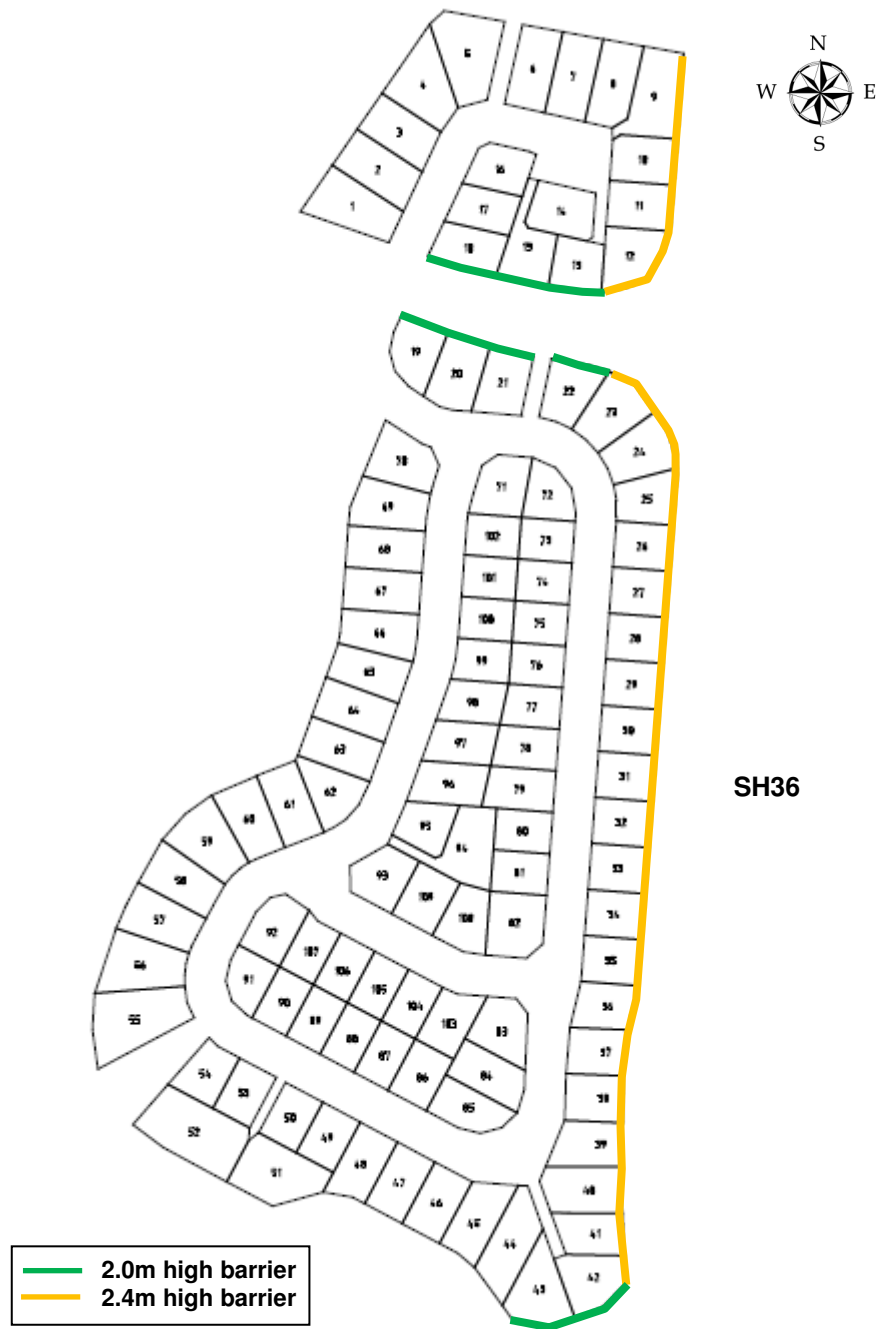


Figure 1. Stage 2UV Site Plan

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 10kg/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.

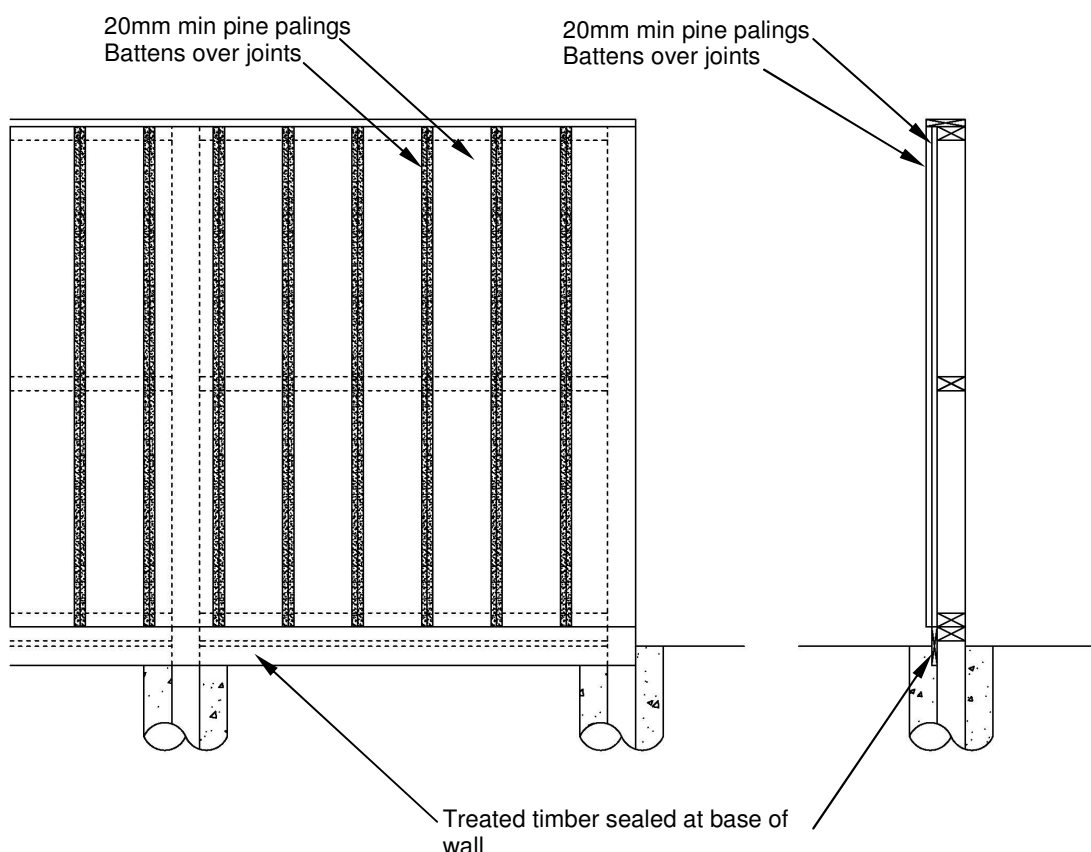


Figure 2. Suitable Timber Wall Detail

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 _{Aeq(24hr)})		Lot	Façade Noise Levels (dB L _{Aeq(24hr)})	
	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 _{Aeq(24hr)})		Lot	Façade Noise Levels (dB L _{Aeq(24hr)})	
	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 _{Aeq(24hour)}
	>	55dB L _{Aeq(24hour)}

Table 1 shows that the predicted facade levels would exceed the 55dB L_{Aeq(24hour)} 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_{Aeq(24hour)}. 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_{Aeq(24hr)} (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_{Aeq(24hr)}.

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/m² 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 $L_{Aeq(24h)}$ 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 $L_{Aeq(30s)}$ when measured 1 metre from any grille or diffuser.

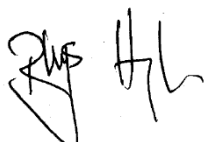
To ensure the appropriate houses are designed to control traffic noise to the upper floor only where barriers are not practical, the following condition could be placed on the titles of Lots 19 - 43:

The first floor of any dwelling shall meet an internal road-traffic design sound level of 40dB $L_{Aeq(24h)}$ 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 $L_{Aeq(30s)}$ 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