

5 July 2021

Wooing Tree Property Development Ltd
C/o Tattico Ltd
PO Box 91562
Victoria Street
Auckland 1142

Attention: John Duthie

Dear John

EPA RFI RESPONSE - ACOUSTICS

Marshall Day Acoustics (MDA) has been engaged to aid in preparing the RFI response to the Environmental Protection Authority letter of 21 June 2021 (FTC000029).

Specifically, items 2(a), 2(d) and 2(e) are addressed below.

Item 2(a)

Information on day and night time noise levels over the application site for internal and external living environments and how those levels relate to the ODP noise standards and applicable WHO standards for acceptable noise levels.

Noise Sources

MDA has conducted modelling of two significant potential sources of existing environmental noise nearby the proposed Wooing Tree Development (Wooing Tree). These are noise arising from vehicles using State Highways 6 and 8B; and noise arising from the operation of nearby frost fans to the west of Wooing Tree.

Vehicle noise contours have been calculated using 2019 AADT traffic volume for both roads. These contours are provided in Figure 1 below.

Analysis of aerial photographs revealed five frost fans to the west of Wooing Tree. The make and model of these frost fans are not known and so we have predicted noise on the assumption that they are the equivalent of Orchard Rite 3000D two-bladed frost fans similar to those we have measured elsewhere in the District. Based on our experience measuring and assessing frost fan noise, the 3000D model is generally the noisiest fan currently available with most other frost fans 3-10 dB quieter. Our predictions are therefore conservative. We note that frost fans run under specific conditions (frost with no wind) only at certain times of year when the crop being protected is vulnerable. We have no information about run duration or frequency at this location.

Frost fan noise contours are provided in Figure 2.

Noise Levels

The dominant noise source across the site is traffic noise from SH6 and SH8B. The site is exposed to between approximately 57 to 67 dB $L_{Aeq(24hr)}$ prior to any allowance for mitigation from screening by fences or buildings as the site becomes developed.

By contrast only a small portion of the Wooing Tree site will receive noise levels more than 55 dB $L_{Aeq(15min)}$, most of which is already reserved as a setback with no buildings.

Figure 1: Vehicle noise contours from SH6 and SH8B.

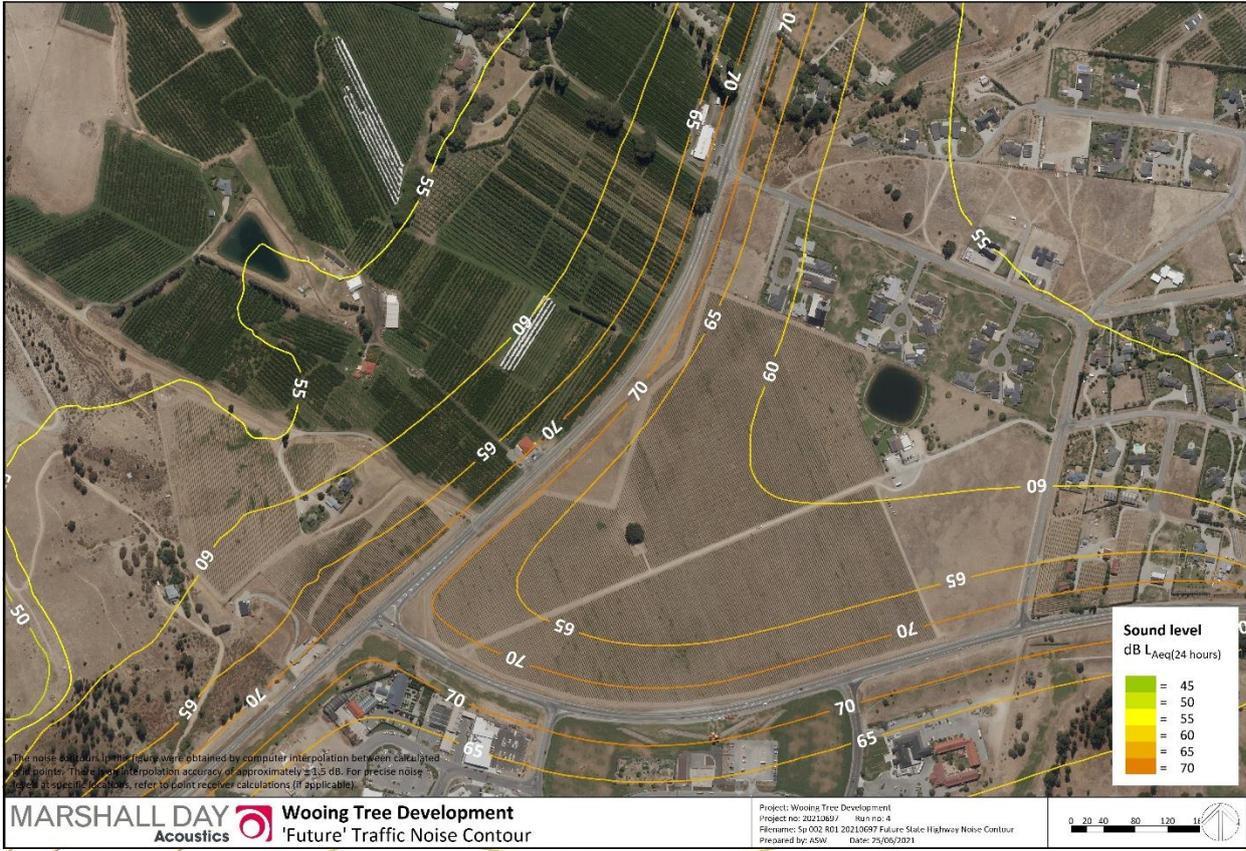
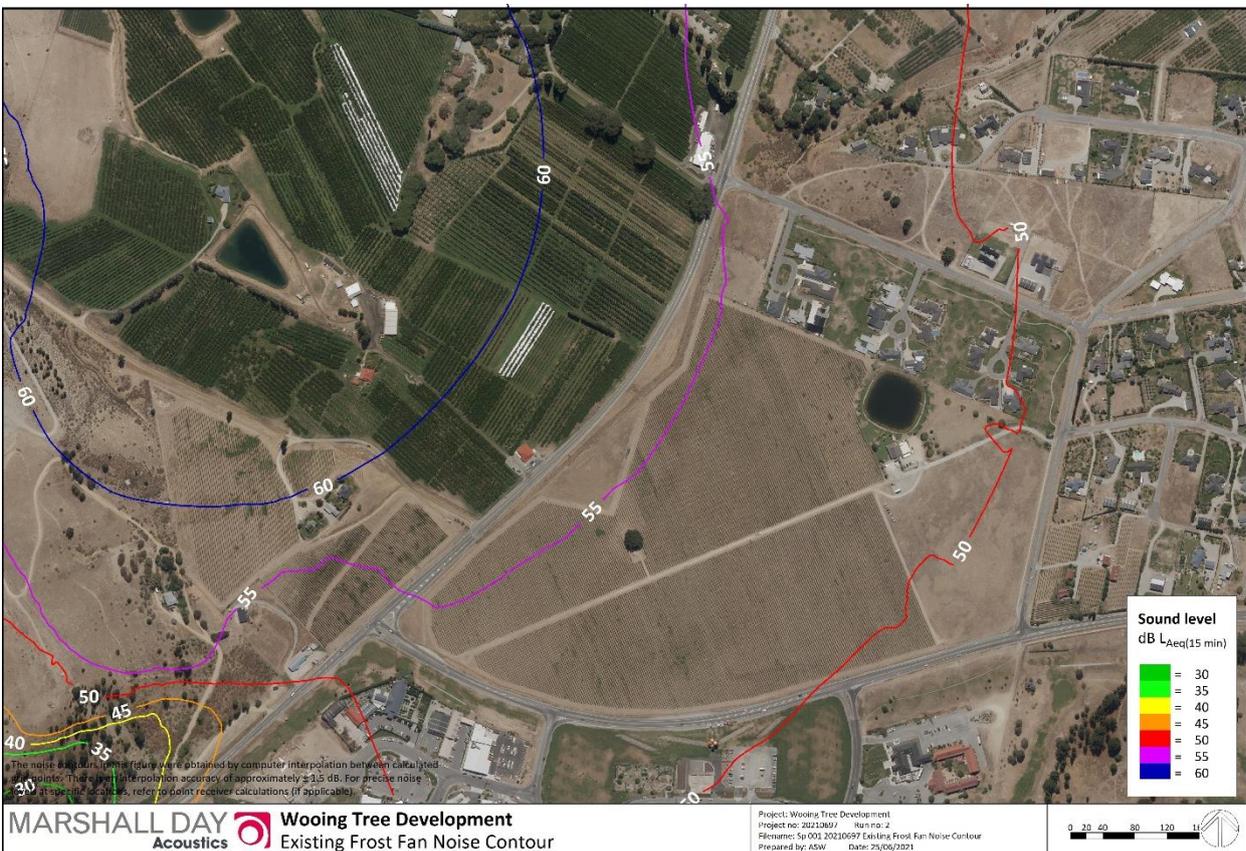


Figure 2: Frost fan noise contours.



District Plan and WHO guidance

The Operative District Plan noise limits are contained in Rule 4.76E(a) of the Central Otago District Plan. This provides for:

- 55 dB L_{A10} daytime (0700 – 2200)
- 40 dB L_{A10} and 70 dB L_{Amax} night-time (2200 – 0700)

A specific noise rule applies to frost fans in Rule 4.7.6E(c), which requires that frost fans are no louder than 65 dB L_{A10} a distance of 300 m and are no closer than 300m from and Residential Resource Area.

Commonly adopted international guidance used in New Zealand is that provided by the WHO Guidelines for Community Noise¹. For community or environmental noise, the critical health effects (those effects which occur at the lowest exposure levels) are:

- Sleep disturbance;
- Annoyance (slight, moderate, high); and
- Speech interference/communication disturbance.

The guideline values for these three critical health effects for community or environmental noise are presented in Table 1. These guidelines, based on extensive international research, are the exposure levels that represent the onset of the effect for the general population. That is, at these noise levels, critical health effects only begin to appear in a small number of vulnerable or sensitive groups.

Table 1: WHO Guideline Values for the critical health effects of community or environmental noise

Specific Environment	Critical health effect(s)	dB L_{Aeq}	Time base (hours)	dB L_{Amax}
Outdoor living area	Serious annoyance, daytime & evening.	55	16	-
	Moderate annoyance, daytime & evening.	50	16	-
Dwellings, indoors Inside bedrooms	Speech Intelligibility and moderate annoyance, daytime & evening.	35	16	-
	Sleep disturbance, night-time.	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values) night-time.	45	8	60

Comparison of existing noise levels against District Plan and WHO Guidelines.

Vehicle noise exceeds the District Plan and WHO guidance across much of the site. However, the level of exceedance is not unusual when compared against many urban settings or small settlements situated on State Highways around New Zealand.

The combination of setbacks already agreed with Waka Kotahi, fencing, and/or sound insulation of dwellings within a nominated area are all appropriate solutions. These are discussed below.

Frost fan noise complies with expectations of the District Plan and is within levels typically expected in a number of Plans around New Zealand for frost fan noise.

Any noise mitigation measures such as barriers and sound insulation requirements that address road noise will also be effective in addressing frost fan noise.

¹ Berglund, B. et al, *Guidelines for Community Noise*. World Health Organisation (1999).

Item 2(d)

Aside from any “no complaints” covenant and the noise attenuation condition proposed to apply for new residential buildings on certain areas of the site, what (if anything) is proposed to mitigate potential effects in respect to noise...

Condition 47 of the proposed conditions is intended to ensure appropriate noise levels with habitable rooms within dwellings in Wooing Tree.

This condition states:

New residential buildings located in the Residential Resource Area, the Residential Resource Area (3) and the Residential Resource Area (11) in the Wooing Tree Overlay Area within 80m of the seal edge of State Highway 6 or 8B shall be designed and constructed to meet noise performance standards for noise from traffic on State Highway 6 or 8B that will not exceed 35dBA $L_{eq(24hr)}$ in bedrooms and 40dBA $L_{eq(24hr)}$ for other habitable rooms in accordance with the satisfactory sound levels recommended by Australian and New Zealand Standard AS/NZ2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors A consent notice to this effect shall be placed on the title of all relevant lots.

This condition is appropriate and achievable. The first row of dwellings closest the State Highways would need to achieve a noise reduction of approximately 35 dB in the absence of any noise control barrier. Dwellings at greater distance, or which receive screening afforded by rows of dwellings between them and the State Highways will require lesser sound insulation. In our experience modern dwelling constructions typically achieve 28 to 35 dB noise reduction against traffic noise. We consider the 80 m setback from the carriageway edge to be appropriate.

While internal noise levels that are appropriate can be readily achieved with sound insulation alone. Noise levels in outdoor living areas cannot be so easily achieved. WHO guidelines suggest the onset of serious annoyance will occur at 55 dB $L_{Aeq(16hr)}$.

Item 2(e)

With respect to mitigation in respect to noise and potential air quality effects from nearby rural land uses, including dust, smoke, odour and spray drift, any changes or improvements to conditions to secure those outcomes, including if relevant:

- i. The condition framework proposed to ensure an effective noise (and potentially air quality) buffer and “elevated contour”;*
- ii. Any redesign to subdivision layout or setbacks to achieve the required noise and air quality buffer distances; and*
- iii. Any other requirements for dwellings that should be addressed in conditions of consent.*

We consider that the condition framework and subdivision layout are adequate to noise effects from surrounding rural land uses.

However, as noted above the noise level in outdoor living areas lacking screening from the state highways will receive noise at levels greater than typically considered desirable. We recommend that residential sections immediately bordering SH6 and SH8B are provided with a 1.8 m high noise control fence of an appropriate design. Any fence should be free from gaps, cracks or holes (including at ground level); and have a minimum surface mass of 8 kg/m². A board and batten design constructed from minimum 20 mm pine palings is durable and has proven effective in many settings. Other options meeting these basic requirements are also acceptable.

Finally, any dwelling within 80 m of the carriageway edge of SH6 or SH8B that is found to require closed windows in order to achieve the specified internal noise levels, should also be required to provide an alternative means of both temperature control and ventilation.

Proposed New and Modified Conditions

We suggest the following modification to conditions 47:

New residential buildings located in the Residential Resource Area, the Residential Resource Area (3) and the Residential Resource Area (11) in the Wooing Tree Overlay Area within 80m of the ~~seal~~ carriageway edge of State Highway 6 or 8B shall be designed and constructed to meet noise performance standards for noise from traffic on State Highway 6 or 8B that will not exceed 35dB $L_{Aeq(24hr)}$ ~~A~~ $L_{Aeq(24hr)}$ in bedrooms and 40dB $L_{Aeq(24hr)}$ ~~A~~ $L_{Aeq(24hr)}$ for other habitable rooms in accordance with the satisfactory sound levels recommended by Australian and New Zealand Standard AS/NZ2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors A consent notice to this effect shall be placed on the title of all relevant lots.

We suggest a new condition, 47b:

Where a dwelling requires that windows are closed in order to achieve the internal noise levels specified in condition 47, an alternative means of temperature control (heating and cooling) shall be provided. An alternative means of providing fresh air for ventilation that meets the requirements of Building Code clause G4 shall also be provided.

Finally, the noise barrier conditions discussed above is recommended:

A noise control fence shall be provided along the entire subdivision boundary adjacent to SH6 and SH8B for all residential sections. The barrier shall have a minimum surface mass of 8 kg/m² and be of durable construction free from gaps, cracks and holes, including at ground level.

Yours faithfully

MARSHALL DAY ACOUSTICS LTD



Rob Hay
Associate