

7 January 2020

Ian Percy
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Dear Ian

246 RIVERBANK ROAD WIND MACHINE REVERSE SENSITIVITY

It is understood there is a proposal to develop a residential subdivision on the existing rural land to the immediate south of your existing Wind Machine located at 246 Riverbank Road. Should this occur there is a potential reverse sensitivity effect from noise generated by the existing wind machine.

I have reviewed the report prepared by Marshal Day Acoustic (MDA) entitled Riverbank Road Wind Machine, Reverse Sensitivity Analysis, Rp 001 20190612 dated 10 September 2019. This report makes recommendations to ensure the proposed residential development does not result in a reverse sensitivity effect for you. I agree with the approach taken by MDA requiring any new dwelling to take into account noise from the wind machine. I also agree there is not a significant difference in the actual noise level produced by the existing Defender wind machine and a Frost Boss C59 five blade machine. However, the Defender machine does have a special audible characteristic to the sound while the C59 does not. Thus, there is a benefit for future neighbours if the existing Defender wind machine blades are replaced with a Frost Boss C59 five blade fan. The effect of this will be to reduce the number of future dwellings that need to have an acoustic design included and where an acoustic design is necessary the required sound reduction will not be as stringent for the Frost Boss C59 as it would be for the Defended machine.

By designing any new dwelling to control noise to the bedrooms as recommended in the MDA report this will enable the occupiers undisturbed sleep based on the recommendations of the World Health Organisation Guidelines for Community Noise and NZS 6802:2008 Acoustic –Environmental Noise. As pointed out in the MDA report it will only be necessary to treat bedrooms as wind machines do not usually operate during the daytime period (defined in the Queenstown Lakes District Plan as 8pm to 8am the following day).

The MDA proposal that any new dwelling should be designed to achieve 30dB $L_{Aeq(15 \text{ min})}$ inside bedrooms is agreed with. It is also agreed that when taking into account the relatively few nights a year the wind machine will operate there is no need to include any alternative ventilation and there is an Environment Court decision that supports this recommendation. It has also been identified that any treatment to achieve the inside design level will vary around the dwelling, the exact level being dependent on the degree of exposure to the wind machine. The reduction around the dwelling will vary from the full exposure to noise on the façade facing the wind machine to partial exposure to the noise where line of sight to the wind machine is just lost, such as the side façade of the dwelling, to the maximum reduction for the façade on the opposite side of the dwelling to the wind machine.

MDA have provided a two building façade designs to cater for two levels of noise exposure. These are considered to be appropriate and it is pointed out that other constructions may also achieve the sound insulation standards, but these would need to be verified by a suitably qualified and experienced acoustic specialist.

To provide guidance on the dwellings that may require specific acoustic treatment the distance from the wind machine that a typical dwelling should be so the design level of 30dB $L_{Aeq(15 \text{ min})}$ inside needs to be determined. Based on field measurements of the typical lightweight dwelling construction a sound reduction in excess of 25dB $L_{Aeq(15 \text{ min})}$ (typically 27 - 28dB) will be achieved with the windows closed when assuming 4mm single glazing in timber joinery. That is, to achieve a level of no more than 30dB $L_{Aeq(15 \text{ min})}$ inside the dwelling then the outside level should not exceed 25dB + 30dB = 55dB $L_{Aeq(15 \text{ min})}$. An external level of 55dB $L_{Aeq(15 \text{ min})}$ will not be exceeded at any distance greater than 250m from the wind machine so by adopting 250m as the design limit will ensure the internal design limit of 25dB $L_{Aeq(15 \text{ min})}$ will be achieved. This assumes slightly positive meteorological conditions, a ground absorption of 0.7 and no screening of the wind machine.

It is recommended that a basic condition such as set out below is adopted with the alternative designs provided by MDA as an option to satisfy the proposed condition. The recommended condition is:

- i) *Any new dwelling, visitor accommodation or other habitable building located within 250 metres of the wind machine not within the same site must be designed and constructed so that within the external building envelope surrounding any bedroom (when the windows are closed), the internal level does not exceed 30dB $L_{Aeq(15 \text{ min})}$;*
- ii) *For the purposes of this rule, "external building envelope" means an envelope defined by the outermost physical parts of the building, normally the cladding and roof;*
- iii) *The acoustic design must be based on the noise contours as shown in Figure 1;*
- iv) *An acoustic design report must be provided to the Queenstown Lakes District Council's Team Leader Monitoring prior to any building consent being granted. The acoustic design report must be prepared by a person qualified and experienced in acoustics and demonstrate the means by which the noise limits specified in this rule will be complied with;*

or

The dwelling has been design to satisfy the building construction as set out in Table 1;

Table 1: Example bedroom constructions

<i>Building element</i>	<i>Minimum bedroom construction requirement</i>
30dB $L_{Aeq(15)}$ reduction	
<i>External walls</i>	
<i>Cladding</i>	<i>Minimum 70mm thick brick (or equivalent mass)</i>
<i>Insulation</i>	<i>Minimum 75mm thick fibrous insulation</i>
<i>Internal lining</i>	<i>Single layer of minimum 10mm thick plasterboard</i>
<i>Windows/glazed doors</i>	<i>Double glazed aluminium joinery consisting of one minimum 6mm thick glass pane and one minimum 6.38mm thick laminated glass pane separated by a 12mm air gap, e.g. 6/12/6.38L. No more than 40% of external wall area</i>
<i>Roof/ceiling</i>	

<i>Cladding</i>	<i>Minimum 0.55mm thick profiled steel</i>
<i>Insulation</i>	<i>Minimum 75mm thick fibrous insulation</i>
<i>Ceiling</i>	<i>Two layers of minimum 13mm thick high-density plasterboard ($\geq 12 \text{ kg/m}^2$) linings (e.g. 2x13mm GIB Noiseline)</i>
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<i>External doors</i>	<i>Solid core door (minimum 24 kg/m^2) with full perimeter seals</i>
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35dB $L_{Aeq(15)}$ reduction	
<i>External walls</i>	
<i>Cladding</i>	<i>Minimum 70mm thick brick (or equivalent mass)</i>
<i>Insulation</i>	<i>Minimum 75mm thick fibrous insulation</i>
<i>Internal lining</i>	<i>Single layer of minimum 10mm thick plasterboard</i>
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<i>Windows</i>	<i>Double glazed aluminium joinery consisting of one minimum 6mm thick glass pane and one minimum 10.76mm thick laminated glass pane separated by a 12mm air gap, e.g. 6/12/10.76L. No more than 20% of external wall area. No doors permitted</i>
 <i>Roof/ceiling</i>	
<i>Cladding</i>	<i>Minimum 0.55mm thick profiled steel</i>
<i>Sarking</i>	<i>Minimum 9mm thick fibre cement board sarking ($\geq 12 \text{ kg/m}^2$) to entire dwelling roof, e.g. 9mm RAB board sarking</i>
<i>Insulation</i>	<i>Minimum 75mm thick fibrous insulation</i>
<i>Ceiling</i>	<i>Two layers of minimum 13mm thick high-density plasterboard ($\geq 12 \text{ kg/m}^2$) linings (e.g. 2x13mm GIB Noiseline)</i>
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<i>External doors</i>	<i>Not permitted</i>
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Note: For the avoidance of doubt, where the windows need to be closed to achieve the internal design level it is not necessary to provide alternate ventilation.

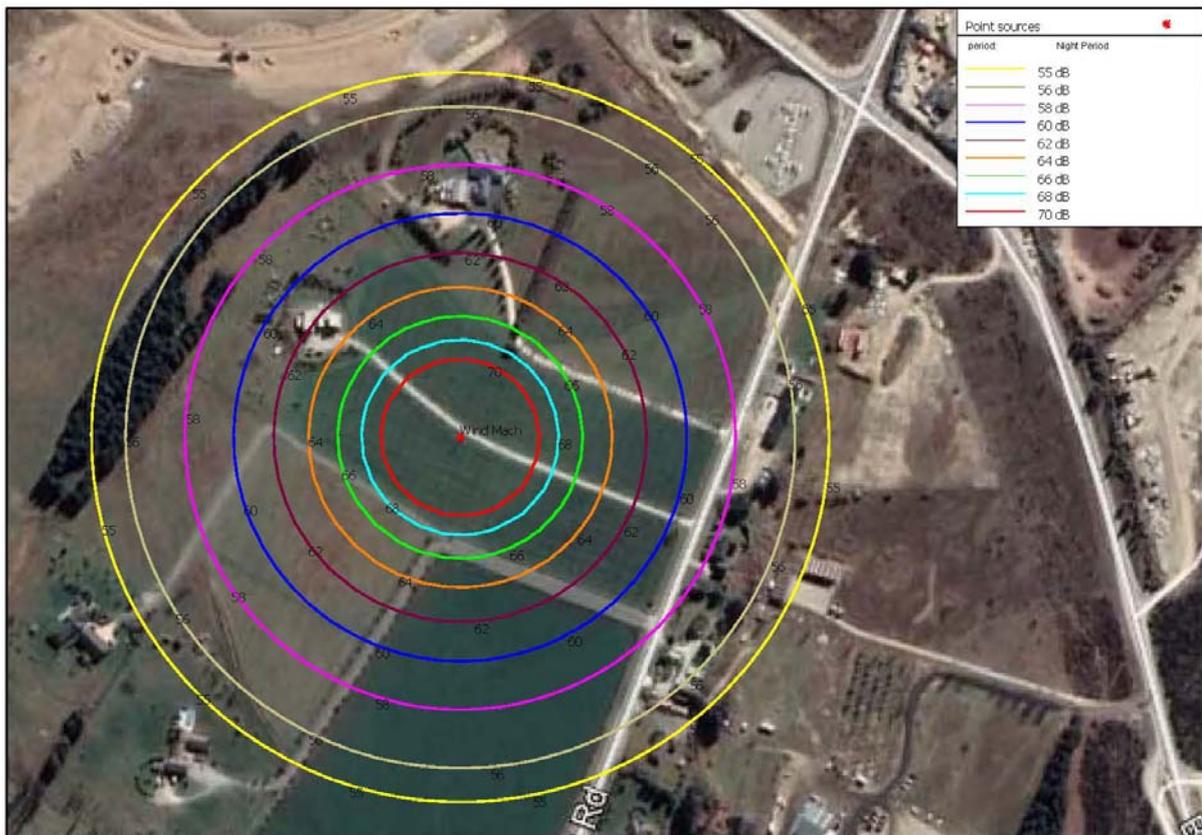


Figure 1. Predicted Wind Machine noise contours

To ensure residents in the proposed subdivisions are fully aware there will be noise from the wind machine it is recommended there is something added to the title, or placed on the LIM report for each site, that advises this out advises wind machine noise will still be clearly audible at these properties.

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

Yours faithfully
Hegley Acoustic Consultants

Nevil Hegley