

2 July 2019

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Dear Eloise

### **MCPHERSON QUARRY**

Thank you for a copy of the request for further information from the Waikato District Council on the noise assessment for the above quarry site.

The first question raised by Council is:

*In terms of the noise assessment provided, there seems to be little regard given to dwellings to the north of the site. There are at several properties with dwellings that are within close proximity. Noise predications will need to be provided when working in the most northern exposed areas including stage 2.*

The most exposed quarry location to the dwellings located to the north is toward the eastern side of the quarry where is the minimum screening effects from the existing ground contour. The closest dwelling to the north is 231 Pinnacle Hill Road, which is located approximately 340m from the quarry boundary.

The most exposed activity to the above dwelling will be the overburden removal after which there is a further increase in the screening of the quarry activities so the small increase in the level of noise from the rock removal is more than compensated for by the increased screening effects of the working face. The quarry will always be worked from below the ground level to the north so the quarry face will be well screened at all times from the closer neighbours.

Based on the existing ground contour and the plant used within the quarry, the noise level from quarrying at the most exposed location to the notional boundary of 231 Pinnacle Hill Road will be 39dB  $L_{Aeq}$ .

Council has noted that one report refers to onsite operations between 5am – 10pm so the noise effects of these activities will need to be addressed.

It is understood the activity that would occur when the lower night time noise limits are applicable is when it is necessary to move overburden after hours for safety reasons. Assuming a D10 bulldozer is used, which is the noisiest plant used for handling overburden (the excavators on site are 12dB  $L_{Aeq}$  quieter) the noise level experienced at the notional boundary of 231 Pinnacle Hill Road will be up to 38dB  $L_{Aeq}$ . This assumes the closest and most exposed location to the dwelling and in those conditions the night time noise limit of 40dB  $L_{Aeq}$  will be achieved with a small factor of safety.

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The effects of blast noise and vibration have been assessed based on the requirements of Rule 23A.5.2.A of the Operative Waikato District Plan (Franklin Section) as set out in the original noise assessment.

Appendix J of Australian Standard AS 2187:2006 Part 2 Explosives - Storage and Use - Use of Explosives (Australian Standards, 2006) recommends the noise and vibration limits shown in Table 4-5.

Table 4-5 Recommended AS 2187 blasting – Human comfort airblast and ground vibration limits

Category	Type of blasting operations	Peak sound pressure level (dBL)	Peak component particle velocity (mm/s)
Sensitive site <sup>a</sup>	Operations lasting longer than 12 months or more than 20 blasts	115dBL for 95% blasts per year. 120dBL maximum unless agreement is reached with occupier that a higher limit may apply.	5mm/s for 95% blasts per year 10mm/s maximum unless agreement is reached with the occupier that a higher limit may apply.

a A sensitive site includes houses and low rise residential buildings, theatres, schools and other similar building occupied people.

Airblast overpressure can be estimated using the following equation:

$$P = K_a \left( \frac{R}{Q^{1/3}} \right)^a$$

where:

- P is the pressure (kPa)
- R is the distance from charge (m)
- Q is the charge mass (kg)
- K<sub>a</sub> is the site constant. AS2187.2-2006 suggests that confined blast hole charges values are commonly in the range of 10 to 100. A value of 100 has been adopted for this assessment and reflects what occurs at the current quarry blasting.
- a For confined blast hole charges AS 2187.2-2006 suggests a = -1.45 as a satisfactory estimate.

The above does not include any screening effects from the topography.

Estimation of ground vibration from blasting can be made using the following equation:

$$V = K_G \left( \frac{R}{Q^{1/2}} \right)^{-1.6}$$

where:

- V is the peak vector sum ground vibration ppv (mm/s)
- R is the distance from charge (m)
- Q is the maximum instantaneous charge (MIC) (kg)
- KG is the ground constant. AS 2187.2-2006 gives a site constant for a free face in average field conditions of 1140, which has been used for the predictions. This value can vary from 1/5 times to 4 times depending on ground conditions and other factors.

Based on the above the predicted blast noise at 231 Pinnacle Hill Road will be 103dBL with the vibration up to 3.5mm/s.

Field measurements of blast noise and vibration have been undertaken on site at a distance from the blast that is similar to the distance to 231 Pinnacle Hill Road. The results of this testing gave an air blast noise of 109dBL with minimal screening included and up to 2.54mm/s vibration. Based on this and taking into account the relative ground screening of the blast noise the predicted level of 103dBL, as set out above, is at the upper level expected when considering that the relative screening effects and the predicted vibration level is also at the upper level expected at 231 Pinnacle Hill Road for the worst case scenario. Regardless, both the blast noise and vibration level is well within the requirements of Rule 23A.5.2.A as set out above.

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

Yours faithfully  
Hegley Acoustic Consultants

A handwritten signature in blue ink, appearing to read 'Nevil Hegley', written in a cursive style.

Nevil Hegley