

**IN THE MATTER**

of the Resource Management Act  
1991

**AND**

**IN THE MATTER**

of applications to the **WAIKATO  
DISTRICT COUNCIL** and  
**WAIKATO REGIONAL COUNCIL**  
by **WEL NETWORKS LTD** for  
resource consents to authorise the  
establishment, operation and  
maintenance of 28 wind turbines  
for the generation of electricity and  
associated activities on the  
Wharauoa Plateau near Te Uku

## **SECOND FURTHER STATEMENT OF EVIDENCE OF NEVIL HEGLEY**

### **1. INTRODUCTION**

- 1.1 My name is Nevil Hegley. My qualifications and experience and involvement in this project are set out in my evidence presented to the committee in November of last year. In that evidence, I also confirmed that I have read and agree to comply with the Environmental Court's code of conduct for expert witnesses.

#### **Purpose and scope of evidence**

- 1.2 The purpose of my evidence is to address a condition suggested by Mr Cox with respect to the measurement of subsonic noise, in response to a specific question raised by the commissioners (section 2).

### **2. SUGGESTED CONDITION**

- 2.1 In his submission presented in the first stage of the hearing, Mr Cox suggested the following condition:

*“That turbine operations must cease permanently if air pressure variations above 0.02mPa with a frequency of less than 15hz due to the turbines are detected more than 2km from the site boundary”*

- 2.2 With respect, this condition as proposed is incomprehensible and would be impossible to apply and enforce. To that extent, the suggested wording indicates to me a fundamental lack of understanding about how noise is measured.
- 2.3 Sound level in decibels is defined as *20 times the logarithmic to the base 10 of the ratio of a given sound pressure to the reference sound pressure of 20 micropascals (20 $\mu$ Pa)*. Mr Cox has adopted 0.02mPa (20 $\mu$ Pa) as a level rather than the reference level to use. That is, no basis has been provided on which to measure noise in terms of any standards making enforcement impractical.
- 2.4 Furthermore, Mr Cox says “*with a frequency of less than 15hz ...*” It is not stated if he means narrow band, 1/3 octave, 1/1 octave or some other band width. It is important to specify the bandwidth otherwise the criteria is meaningless. By way of a comparison it is the same as asking for the length of something. To provide an answer you need to know what is to be measured and if the length is to be in inches, metres or some other unit.
- 2.5 If we assume that Mr Cox means that the turbines must not emit any noise (ie 0dB) at some low frequency then this becomes even more difficult to understand. As presented to the Commissioners in Figure 12 of my further evidence, this shows that the threshold of hearing at 10Hz is around 98dB and this increases to 120dB at 2Hz. Mr Cox appears to be seeking a level 98 – 120dB below the threshold of hearing. This means that the noise should be the same level below the threshold of hearing that a loud night club band is above the threshold of hearing. A paper written by Mr George Bellhouse<sup>1</sup> on low frequency (attached to this evidence at Appendix A) makes it clear that 0dB at a low frequency is unnecessary to protect people from low frequency noise.
- 2.6 Of greater concern is that I believe it would be impossible to measure such a low level and equally impossible to separate any such WTG noise from ambient sounds at such hypothetical levels.
- 2.7 In order to demonstrate the impracticality of such a proposal I have measured the noise inside a closed room late at night. This has enabled me to measure the sound spectrum with a background sound ( $L_{95}$ ) of 17dBA. When using a 1.25Hz bandwidth the level at 1.25Hz was 83dB, at 2.5Hz it was 86dB, at 5Hz 74dB, at 10Hz 65dB dropping to 54dB at 15Hz. That is, in a very quiet room in the early

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<sup>1</sup> Low Frequency Noise and Infrasound from Wind Turbine Generators: A Literature Review. Prepared for Energy Efficiency and Conservation Authority by George Bellhouse 30th June 2004

hours of the morning with a background sound of 17dBA the low frequency sound was up to 86dB above the level apparently being sought by Mr Cox. It is impossible to measure a sound that is 10dB or more below the background sound. Of course, when outside, these levels would all be higher. As already pointed out, the background sound outside in the Raglan area would not drop below 23 - 24dBA.

- 2.8 Therefore, in my view, this condition is not only incomprehensible, but also completely unworkable. Furthermore, the condition is unnecessary because even if there were any noticeable low frequency noise (and I do not believe there will be) it would be controlled by a combination of the measured level in dBA and a 5dBA adjustment due to any special audible characteristic in terms of the requirement of NZS6808. On that basis, I do not agree that the condition as proposed by Mr Cox should be imposed on the resource consent.

**Nevil Hegley**  
**February 2008**