

**BEFORE THE PROPOSED WAIKATO DISTRICT PLAN HEARINGS  
PANEL**

**WAIKATO DISTRICT COUNCIL**

**IN THE MATTER** of the Resource Management Act 1991

**AND**

**IN THE MATTER** of the Proposed Waikato District Plan

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**STATEMENT OF EVIDENCE OF DARRAN HUMPHESON  
ON BEHALF OF NEW ZEALAND DEFENCE FORCE  
SUBMITTER 796**

**21 June 2021**

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## **STATEMENT OF EVIDENCE OF DARRAN HUMPHESON ON BEHALF OF NEW ZEALAND DEFENCE FORCE (NZDF) – SUBMITTER 796**

### **INTRODUCTION**

- 1 My full name is Darran Humpheson. I am a Senior Acoustics Specialist at Tonkin & Taylor Limited. I am providing evidence on behalf of New Zealand Defence Force (**NZDF**).
- 2 I hold a Bachelor of Science degree with Honours in Applied Physics and a Master of Science degree in Environmental Acoustics. I am a Member of the Acoustical Society of New Zealand and a Member of the United Kingdom's Institute of Acoustics. I am a New Zealand representative of the International Standards Organisation (**ISO**) technical committee ISO/TC 43 SC1 "Noise".
- 3 I have been employed in acoustics since 1991, and have previously held positions as a consultant for international firms AECOM (Technical Director 2013-2019), Bureau Veritas (Technical Director 2012-2013), RPS Group plc (Technical Director 2002-2012) and as a UK Ministry of Defence scientist (Head of the Royal Air Force's Noise and Vibration Division 1991-2002).
- 4 Of relevance to this hearing I have provided acoustics services for military activities specialising in aviation and weapon noise.
- 5 I am familiar with NZDF's submission on the proposed Waikato District Plan (**pWDP**).
- 6 Where appropriate, my statement of evidence, references the statement of evidence provided by Ms Rebecca Davies of NZDF.

### **CODE OF CONDUCT**

- 7 I confirm that I have read the Environment Court's Code of Conduct for Expert Witnesses set out in the Environment Court's Code of Practice Note 2014. I agree to comply with this Code. I confirm that the issues addressed

in this statement of evidence are within my area of expertise and that I have not omitted to consider any material facts known to me that might alter or detract from my opinions expressed in this evidence.

### **TEMPORARY MILITARY TRAINING ACTIVITIES**

- 8 NZDF undertakes TMTA across the country as part of its duties to maintain the nation's security, maintaining NZDF operational capacity and providing for the well-being, health and safety of New Zealand's communities.
- 9 Training activities are essential in maintaining the capability of the armed forces so that NZDF is ready to respond to a wide range of national and international situations, including providing aid and assistance following emergencies such as earthquakes and major storm events. As Ms Davies has explained, TMTA are carried out off-base to 'test' personnel and resources in unfamiliar surroundings and to provide 'realism' to the skills learnt on-base.
- 10 TMTA by definition are temporary in nature and can vary in duration from a couple of hours or days to a few weeks depending upon the type and scale of the activity. TMTA may take place in a variety of locations ranging from built-up urban areas to remote rural sites. The ability to undertake TMTA across these zones is important and Ms Davies in her Statement of Evidence provides further explanation as to why this is important.
- 11 The Waikato area is an area where NZDF may choose to undertake TMTA as part of personnel training. As Ms Davies outlines, it is a strategic location in particular due to its proximity to the Auckland region and significant Defence Camps and Bases located there.

### **NOISE SOURCES**

- 12 Not all TMTA include impulsive noise associated with weapon firing, grenades and "battle simulation" pyrotechnics. For much of the time, the noise associated from TMTA may be low level with occasional periods of higher levels of noise.

- 13 The noise generated by TMTA may be categorised by the following:
- a) Impulsive noise - live and blank firing and explosions;
  - b) Mobile sources, such as vehicles and earth moving equipment;
  - c) Fixed sources, such as power generators and water pumps; and
  - d) Helicopter landings.
- 14 These four categories of noise may occur in isolation or in combination and each category of noise has its own characteristics in terms of noise level (magnitude), duration (transient or continuous) and frequency (low or high frequency/pitch). The character of each noise source means that different noise assessment methods are relevant when controlling and assessing noise effects.
- 15 The following sections consider each type of noise category and the relief sought in the pWDP.

### **Weapons firing and/or the use of explosives**

- 16 Live and blank firing activities are relatively infrequent and are recognised as being a unique source of noise, specific to certain forms of TMTA. Weapon firing and the detonation of explosives are typically performed within designated training areas; however, firing of blank ammunition on land controlled by a private or public owner does occur and will more commonly be from small arms (rifles).
- 17 Unlike other sources of impulsive noise which commonly occur in the district (bird scarers, alarms etc), the impulsive characteristics of weapon firing and/or use of explosives by NZDF warrants a different assessment approach compared to the average noise level assessment approach routinely applied in district plans<sup>1</sup>.
- 18 In comparison to general environmental noise sources, TMTA impulsive noise has a strong low frequency component, has a very fast rise time and

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<sup>1</sup> Average level being measured and assessed by the LEQ noise metric.

very short decay (very short duration), has a much greater magnitude and typically only lasts for a short period (typically less than 100 milliseconds).

- 19 New Zealand Standard NZS 6801:2008 'Acoustics – Measurement of environmental sound' is a mandatory noise standard of the National Planning Standards. NZS 6801:2008 requires that an impulse noise source is measured using the peak level and either the C-weighting or the Z-weighting ( $L_{peak}$ ) is applied. C-weighting is more commonly used as it more accurately mimics the frequency response of the human ear to low frequency impulsive noise.
- 20 NZS 6801 states that use of the LEQ noise or LMax descriptor should not be used to measure impulsive noise sources. However these two noise descriptors have been used in the pWDP to rate the noise from all sources of TMTA, including weapon firing and explosives. This is incorrect and reflects a misunderstanding of the technical differences between  $L_{peak}$ , LEQ and LMax.
- 21 New Zealand Standard NZS 6802:2008 Acoustics – Environmental Noise is used as the starting platform for setting district plan environmental noise limits within New Zealand. This has been applied in the pWDP to all activities including weapons firing and the use of explosives. However, as set out in Clause 1.2 of that Standard, it was not designed to assess impulse type sounds such as gunfire and explosions for the following reasons:
  - a) There is no provision in NZS 6802 to assess impulsive noise sources using  $L_{peak}$  and there are no recommendations on appropriate noise limits. NZS 6801 is clear that impulsive noise should not be measured using LEQ or LMax.
  - b) Noise assessed using the recommendations of NZS 6802 will significantly under-assess the true noise effects of gunfire and weapon

due to the inability of LMax and especially LEQ to 'react/respond'<sup>2</sup> to these very short duration noise events.

- 22 Of relevance to TMTA, NZS 6803:1999 Acoustics – Construction Noise sets out a guideline maximum “peak” sound level due to explosions. NZS 6803:1999 states at clause 8.1.4:

*“Noise from use of explosives is also a special case. The adoption of good blasting practices will reduce the inherent and associated impulsive noise and vibration. Practices should conform with the provisions of documents such as AS 2187:Part 2 [Explosives—Storage and use Part 2: Use of explosives 2006], provided that the airblast noise limit shall be a peak sound level of 120 dBC measured at a suitable location as specified in 6.1.”*

- 23 Whilst an absolute peak sound pressure level limit of 120 dBC is recommended in NZS 6803:1999, NZDF applies a more rigorous level of either 95 dBC during the ‘day time’ period from 0700 to 1900 hrs or 85 dBC for the ‘night time’ period from 1900 to 0700 hrs.

- 24 Malcolm Hunt Associates (MHA), on behalf of NZDF, prepared a noise report on TMTA noise<sup>3</sup>. This technical report details the source levels for a range of weapon types and explosives. The MHA report proposes the use of a setback distance to assist both in the planning of TMTA and for use within district plans.

- 25 For typical TMTA weapon firing, the peak levels I have outlined above correspond to setback distances of 500m and 1,250m respectively. The setback distances are based on worst case positive downwind sound propagation conditions. In practice, the resulting sound levels will be lower than these due to more favourable propagation conditions. The setback distances therefore ensure the appropriate noise limits will be met with a

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<sup>2</sup> There could be more than a 30 dB difference between impulse noise measured using Lpeak and LMax, due to the different response times of each noise metric. For a single gunfire measured using Lpeak and LEQ, the noise level difference could be more than 70 dB.

<sup>3</sup> Re-Assessing Noise from Temporary Military Training in New Zealand District Plan Recommendations, Malcolm Hunt Associates, January 2013

factor of safety built into them.

- 26 I consider that the setback distance has merit because it allows NZDF personnel with no acoustics knowledge to plan where firing may occur without adversely affecting residential amenity. It also provides certainty to Councils as the distance at which an activity occurs can be measured without the need to undertake compliance noise monitoring. A further advantage to the setbacks is that weather conditions do not need to meet the prescribed standards for undertaking noise measurements.
- 27 The use of setback distances is used overseas where temporary military training occurs. For example, in the United Kingdom the control of noise from ranges, including temporary areas used for training, is documented within Joint Services Publication (JSP) 403. The JSP notes that *'distance is the most cost effective reduction measure available'* and the JSP provides setback distances for a range of weapon types, including small arms involving battlefield simulation (blanks). NZDF is proposing a similar approach by using set-back distances as the most practicable means of controlling the noise from weapons and / or explosions used in TMTA.
- 28 In summary, NZS 6803:1999 sets out a guideline maximum "peak" sound level of 120 dBC. However, NZDF proposes a more stringent day time peak sound level limit ( $L_{peak}$ ) of 95 dBC from 0700 to 1900 hrs and a night time limit of 85 dBC from 1900 to 0700 hrs.
- 29 It is my opinion that the day time limit is sufficient to preserve residential amenity when experienced either indoors or outdoors and the night time limit is sufficient to prevent loss of sleep quality<sup>4</sup>. The use of setback distances when planning TMTA provides additional assurance that these peak sound levels will be achieved.

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<sup>4</sup> Sleep quality is dependent upon the sound level, frequency of events and the cumulative effects over multiple nights. A single night of 'noise' has been shown by the World Health Organisation to have a negligible effect on sleep quality. Whereas multiple exposures will result in a gradual reduction in sleep quality. This observation also applies to general TMTA noise. Source - WHO, Environmental Noise Guidelines for the European Region, 2018.

### **Mobile / fixed noise sources**

- 30 TMTA mobile sources can include moving vehicles, earthmoving equipment and personnel which are typically intermittent and infrequent. They will typically be present during daytime hours only and have similar noise and operating characteristics to vehicles and plant (earthmoving equipment) used on construction sites (as assessed using NZS 6803:1999).
- 31 A fixed source could be a generator or water pump which has a static location. These types of sources, which may run continuously during the TMTA, are more easily controlled through careful selection and siting of the equipment on site, and through noise control methods such as screening.
- 32 The noise limits proposed by NZDF using NZS 6803:1999 for mobile sources and NZS 6802:2008 for fixed sources relies on well established standards that are appropriate for these types of sources. This appears to be accepted in the section 42A report, although this is not reflected in the proposed noise standards which instead reference back to the approach anticipated under NZS 6802:2008, i.e. it ignores the relief sought for mobile sources.
- 33 Assessing different aspects of typical TMTA appropriately for the type of noise source, i.e. by separating out mobile and fixed sources will provide more consistent controls for these types of activities, and will benefit NZDF by being consistent across the country.

### **Helicopter landings**

- 34 Within New Zealand helicopter noise is assessed using NZS 6807:1994 Noise Management and Land Use Planning for Helicopter Landing Areas. The scope of the Standard is intended to apply to helicopter landing areas used for ten or more flights in any month or where flight movements are likely to result in a maximum sound level (LMax) exceeding 70 dBA at night or 90 dBA during day-time in any residential zone or within the notional

boundary of any rural dwelling.

- 35 From discussions with NZDF, I understand that TMTA only very occasionally involve the use of helicopters and temporary landing areas may be required on private and public land (with land owner permissions). Whilst these areas are not permanent sites, the number of flights that may be generated can be very low, e.g. a single landing and take-off. In other situations there can be multiple movements during the day and at night.
- 36 Councils do not have the power to control noise from overflying aircraft when aircraft are not in the vicinity of a landing area. Councils do however have the power as consent authorities to control the movement of aircraft by managing the effects of aircraft noise in the vicinity of landing areas. For temporary landing areas (fewer than ten flights in any month) specific controls are not required as the effects are considered acceptable.
- 37 However it is important to note that for noisy helicopter movements (above the noise levels quoted above and regardless of the number of movements, NZS 6807:1994 will still apply.
- 38 Compliance with NZS 6807:1994 will in my opinion result in reasonable levels of noise such that the noise effects from temporary helicopter landing areas will be acceptable.

## **RELIEF SOUGHT**

### **Weapons firing and/or the use of explosives**

- 39 I have provided the justification for weapon noise and the NZDF seeks the following relief with respect to this noise source:

*Notice is provided to the Council at least 5 working days prior to the commencement of the activity.*

*The activity complies with the following minimum separation distances to the notional boundary of any building housing a noise sensitive activity:*

*0700 to 1900 hours: 500m*

*1900 to 0700 hours: 1,250m*

*Where the minimum separation distances specified above are not met, then the activity shall comply with the following peak sound pressure level when measured at the notional boundary of any building housing a noise sensitive activity:*

*0700 to 1900 hours: 95 dBC*

*1900 to 0700 hours: 85 dBC*

**Mobile / fixed sources**

- 40 I have shown that the noise from mobile and fixed sources is different and should be assessed separately.
- 41 NZDF seeks the following relief with respect to fixed and mobile noise sources:

***Mobile noise sources***

*Shall comply with the noise limits set out in Tables 2 and 3 of NZS6803:1999 Acoustics – Construction Noise, with reference to ‘construction noise’ taken to refer to mobile noise sources\*.*

*Note: Mobile noise sources (other than firing of weapons and explosives) include personnel, light and heavy vehicles, self-propelled equipment, earthmoving equipment.*

### **Fixed (stationary) noise sources**

Shall comply with the noise limits set out in the table below when measured at the notional boundary of any building housing a noise sensitive activity\*.

<b>Time (Monday to Sunday)</b>	<b>LAeq (15 min)</b>	<b>LAFmax</b>
0700 to 1900 hours	55 dB	n.a.
1900 to 2200 hours	50 dB	
2200 to 0700 hours the next day	45 dB	75 dB

Note: Fixed (stationary) noise sources (other than firing of weapons and explosives) include power generation, heating, ventilation or air conditioning systems, or water or wastewater pumping/treatment systems.

\* Noise levels shall be measured in accordance with NZS 6801:2008 Acoustics – Measurement of Sound and assessed in accordance with NZS 6802:2008 Acoustics – Environmental Noise.

### **Helicopter landing areas**

- 42 I have explained why in my opinion NZS 6807:1994 is relevant. Accordingly, NZDF seeks the following relief with respect to helicopter landing area noise sources:

#### **Helicopter landings**

Shall comply with NZS6807:1994 Noise Management and Land Use Planning for Helicopter Landing Areas\*.

\*Noise levels shall be measured in accordance with NZS6801:2008 Acoustics – Measurement of Sound.

### **CONCLUSION**

- 43 Temporary military training activities are essential and in many respects are identical to training activities carried out by other emergency services and commercial organisations. NZDF is seeking to apply a standard set of

rules to TMTA noise that can be consistently used in district plans throughout the country. These controls are proposed for the pWDP.

- 44 As noted in my evidence, I consider that the relief sought will result in acceptable noise effects that appropriately protect amenity values.

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Darran Humpheson

21 June 2021