IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of Chapter 12: General and District-wide (excluding Financial Contributions) of the Proposed Kāpiti Coast District Plan

STATEMENT OF EVIDENCE OF DR STEPHEN GORDON CHILES FOR KIWIRAIL HOLDINGS LIMITED IN RELATION TO ACOUSTICS

2 MAY 2016

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EXECUTIVE SUMMARY

A. The proposed Kāpiti Coast District Plan ("**PDP**") includes controls to manage railway noise effects in new and altered habitable rooms within buildings. I consider that such controls are necessary and appropriate, and should also apply to habitable rooms within buildings that are relocated. To be efficient and effective I recommend several changes to the version of rule 12D.1.12 in the Section 42A report.

B. Sound levels from railways are higher close to railways than they are further away. Therefore sound insulation requirements should also be more stringent closer to railways. The PDP only proposes one sound insulation standard ($D_{2m,nT,w}+C_{tr}$ > 30 dB), which is not adequate for buildings close to railways. I recommend changing the criteria in the PDP to use internal sound levels, which would avoid this issue. However, if maintaining the current framework in the PDP I recommend a higher standard of sound insulation for buildings within 40 metres of railways, commensurate with the approach in the PDP for roads ($D_{2m,nT,w}+C_{tr}$ > 35 dB).

C. Noise effects from railways can extend for a significant distance from railways. Sound insulation for buildings can be required at distances of 80 metres from a railway. The controls for railway noise in rule 12D.1.12 of the PDP are limited to 40 metres from a railway, and I recommend these be increased to at least 80 metres.

D. In my opinion sound insulation controls in the PDP would be more efficient if combined road and railway requirements of rule 12D.1.12 were shown on an overlay on district plan maps.

E. Any threshold for sound insulation in terms of percentage changes to floor area would be an arbitrary criterion that results in practical opportunities for noise exposure to be reduced being missed. I consider acoustic treatment should apply to all alterations.

F. Rule 12D.1.12.6 includes appropriate ventilation requirements, but these need to be invoked by part (a) of rule 12D.1.12.4 as well as part (b) where they are currently referenced.

1. QUALIFICATIONS AND EXPERIENCE

1.1 My full name is **Dr Stephen Gordon Chiles**

1.2 I am an acoustics engineer and Independent Hearings Commissioner, and am self-employed by my company Chiles Ltd. I am separately employed half-time by the NZ Transport Agency ("**Transport Agency**") as a Principal Environmental Specialist, responsible for state highway noise and vibration. I am also a visiting academic at the University of Canterbury Acoustics Research Group.

1.3 I have the qualifications of Doctor of Philosophy in Acoustics from the University of Bath, and Bachelor of Engineering in Electroacoustics from the University of Salford, UK. I am a Chartered Professional Engineer, Fellow of the UK Institute of Acoustics and Member of the Resource Management Law Association.

1.4 I have been employed in acoustics since 1996, as a research officer at the University of Bath, as a consultant for the international firms Arup, WSP, and URS, and for the specialist firms Marshall Day Acoustics and Fleming & Barron. I have been responsible for acoustics assessments and design for numerous different activities including infrastructure, industrial, commercial, recreational and residential developments. I routinely work for central and local government, companies and individual residents.

1.5 I have been involved in many situations relating to noise reverse sensitivity effects. I was an Independent Commissioner for plan changes for Queenstown and Wanaka Airports and a plan variation for Port Nelson, which dealt particularly with noise reverse sensitivity effects. I have previously been engaged to advise Auckland Transport and KiwiRail on reverse sensitivity noise issues. I jointly led a recent review of the Transport Agency's reverse sensitivity policy for state highways and development of its new guide[1]. I have presented acoustics evidence for the Transport Agency on numerous plan

[1] NZ Transport Agency, *Guide to the management of effects on noise sensitive land use near to the state highway network*, September 2015.

changes and plan reviews. I was responsible for producing draft provisions for Clause G6 of the New Zealand Building Code relating to reverse sensitivity for the Ministry of Business, Innovation and Employment.

1.6 I am convenor of the New Zealand industry reference group for the international standards committee ISO TC43 (acoustics) and its subcommittees SC1 (noise) and SC2 (building acoustics), which is responsible for approximately 200 published "ISO" standards relating to acoustics. I was Chair of the 2012 Standards New Zealand acoustics standards review group, Chair for the 2010 wind farm noise standard revision (NZS 6808), and a member for the 2008 general environmental noise standards revision (NZS 6801 and NZS 6802).

1.7 I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014. This evidence is within my area of expertise except where I state that I am relying on facts or information provided by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

2. SCOPE OF EVIDENCE

2.1 My evidence relates to provisions for protection of noise sensitivie activities from railway noise in the proposed Kāpiti Coast District Plan ("**PDP**"). It primarily relates to rule 12D.1.12 in the PDP as amended in the Section 42A Report, which is based on acoustics advice provided to the Council by Malcolm Hunt. All references in my evidence to the PDP relate to this amended version.

2.2 I am presenting evidence as an independent consultant to KiwiRail. I have been separately involved in the Transport Agency's submission as a half-time employee, but this evidence has not been prepared in that capacity and does not directly relate to road-traffic noise.

2.3 I have prepared my evidence on the basis of my experience assessing railway noise at various locations around New Zealand, and from

developing a draft code for KiwiRail to manage noise and vibration from the railway network. In preparing that draft code I reviewed noise and vibration monitoring data and obtained information relating to railway infrastructure procurement, operations and maintenance. With respect to reverse sensitivity I have drawn from information contained in a report "*Ontrack Rail Noise Criteria, Reverse Sensitivity Guidelines*" by Marshall Day Acoustics, dated 22 October 2009. I have also drawn from my broader experience assessing other environmental sources and in particular from my extensive experience of road-traffic noise issues.

2.4 The broad framework in the PDP for addressing railway noise affecting new and altered buildings is generally adequate. However there are several important areas where I consider the rules require modification, which I will address in my evidence:

(a) sound insulation standards;

(b) extent of sound insulation controls;

(c) thresholds for application of the controls; and

(d) ventilation requirements.

2.5 In my evidence when I refer to buildings my comments apply to all spaces or rooms in buildings containing noise sensitive activities.

3. SOUND INSULATION STANDARDS

3.1 The aim of rule 12D.1.12 is to reduce railway noise inside buildings to provide an internal environment whereby people have reasonable amenity and protection from sleep disturbance. Two common ways of achieving this are either to specify internal sound levels directly, or to specify the sound insulation of buildings that should consequently result in those same internal levels. There are benefits and drawbacks with either approach.

3.2 On balance, for railway (and road-traffic) noise I recommend specifying internal sound levels as it avoids unnecessary expenditure on building components and allows each building to be built to an appropriate design for its specific site and layout. I consider this to be the most efficient and effective mechanism to manage railway noise effects in new and altered buildings.

3.3 The PDP adopts the alternative approach of specifying sound insulation of the building. While I recommend changing the rule fundamentally to specify internal sound levels, my following comments address changes that I consider are required if the current approach in the PDP is maintained.

3.4 The PDP specifies the same sound insulation standard in rule 12D.1.12.1 for a range of different sound sources including railways. However, for railways the sound levels at buildings vary and are significantly louder at locations close to the track than at more distant locations. Therefore the required sound insulation also varies.

3.5 The sound insulation specified in rule 12D.1.12.1 is adequate for buildings approximately 40 metres from a railway, but based on typical railway sound levels, a higher standard is required when closer to the tracks. I recommend that within 40 metres of a railway the sound insulation standard should be increased to $D_{2m,nT,w}+C_{tr} > 35$ dB.

3.6 Rule 12D.1.12.2 already specifies this increased value for sound insulation when within 40 metres of state highways. To achieve the required sound insulation for railway noise, I recommend that rule 12D.1.12.2 should be extended to apply within 40 metres of railways as well as state highways.

4. EXTENT OF SOUND INSULATION CONTROLS

4.1 Currently sound insulation controls in rule 12D.1.12.1 only apply within 40 metres of railways, wheras they extend to 80 metres from state highways. For railways, sound insulation is typically required at distances up to 80 metres, and sometimes beyond.

4.2 For example, when the designation for the railway in Otaki was recently changed, a designation condition was imposed that requires KiwiRail to assess two buildings, approximately 60 and 80 metres from the track, for sound insulation. In the same way that KiwiRail has been required to address sound insulation of existing buildings 80 metres from the new track when it changes the railway, I consider new, altered and relocated buildings should be required to address sound insulation from existing railways within 80 metres. I recommend rule 12D.1.12.1.f be amended to apply the same distance to railways as currently specified for state highways.

4.3 Within the Kāpiti Coast district there is a potential synergy for sound insulation controls for roads and railways, because through most of the district they share the same corridor. Even when the new expressway results in the state highway being separated from the railway, the existing state highway will remain as an arterial with relatively high traffic volumes. Given the co-location of roads and railways I consider the sound insulation rules could be simplified as set out below.

4.4 I have read the evidence of Michael Smith for the Transport Agency and I agree with his proposal to include an overlay on the district plan maps showing where sound insulation controls in rule 12D.1.12 apply. I recommend this overlay should include railways as well as roads. This would make the plan easier to understand and apply, particularly where buildings are subject to both railway and road-traffic noise, which is often the case in this district. In this manner, people building buildings would be able to refer to a single set of maps and apply appropriate sound insulation controls to address both road-traffic and railway noise.

5. THRESHOLDS FOR APPLICATION OF THE CONTROLS

5.1 In the Kāpiti Coast district there is already existing railway noise exposure of buildings that exceeds values recommended by the World Health Organisation (WHO). WHO guidelines make reference to

adverse effect above levels of 50 to 55 dB outside buildings and above 30 dB in bedrooms. These ideal criteria are also exceeded in most other countries. The controls in rule 12D.1.12 do not address that existing exposure but seek to avoid compounding the issue, and to gradually reduce levels in buildings and improve health and amenity over time.

5.2 For a new, altered or relocated buildings it is practical to include acoustic treatment as required to achieve appropriate internal sound levels. Likewise, when extending a building with a new or altered living room or bedroom, it will be practical to incorporate appropriate acoustic treatment. In the same way, I understand any such extensions would be required to comply with all current Building Code requirements rather than those that applied when the building was first built.

5.3 I am aware of debate as to what controls should apply if a living area is extended but the noise exposure is still controlled by existing windows which are not proposed to be altered as part of the extension. In some district plans, thresholds for acoustic treatment have been set in terms of a percentage increase to the floor area, and in other district plans controls have applied to all additions.

5.4 The definition of "altered habitable room" in rule 12D.1.12 of the PDP restricts sound insulation controls to rooms extended by more than 10%. I consider this to be inappropriate as any threshold for acoustic treatment in terms of percentage changes to floor area would be an arbitrary criterion that will result in practical opportunities for noise exposure to be reduced being missed. Therefore, I consider sound insulation controls should apply to all alterations or relocations, and the definition of "*altered habitable room*" in rule 12D.1.12 should be changed by deleting the words "*by 10% or more*" and "*with an area more than 5% of the floor area of the room*".

6. VENTILATION REQUIREMENTS

6.1 Based on advice I have previously received from building services specialists, I consider that rule 12D.1.12.6, provides an appropriate specification for ventilation systems. The specification would allow occupants to leave windows closed to provide sound insulation while at the same time providing reasonable thermal comfort.

6.2 I have identified an issue with the drafting of rule 12D.1.12.4, which invokes the ventilation requirements in rule 12D.1.12.6. In rule 12D.1.12.4 a ventilation system is only required under sub-section (b), whereas it should also be required under sub-section (a). I recommend part (a) should be amended by inserting "*and has a ventilation system installed as required under (6) below*".

Dr Stephen Gordon Chiles
2 May 2016