BEFORE INDEPENDENT COMMISSIONERS

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of submissions by Waka Kotahi New Zealand Transport Agency (**"Waka Kotahi"**) (submitter S373, further submitter FS110) and KiwiRail Holdings Ltd (**"KiwiRail"**) (submitter S275, further submitter FS99) on the Waimakariri Proposed District Plan (**"PDP"**)

STATEMENT OF EVIDENCE OF STEPHEN CHILES ON BEHALF OF WAKA KOTAHI NZ TRANSPORT AGENCY AND KIWIRAIL HOLDINGS LIMITED

ROAD AND RAIL NOISE AND VIBRATION

1. INTRODUCTION

1.1 My full name is Dr Stephen Gordon Chiles. 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 and Fellow of the UK Institute of Acoustics.

1.2 I am self-employed as an acoustician through my company Chiles Ltd. I have been employed in acoustics since 1996, as a research officer at the University of Bath, a principal environmental specialist for Waka Kotahi, and a consultant for Arup, WSP, and URS, Marshall Day Acoustics and Fleming & Barron. I am contracted as the principal advisor to provide the Environmental Noise Analysis and Advice Service to the Ministry of Health and Te Whatu Ora.

1.3 I have been involved in many situations relating to noise effects on new or altered sensitive activities around existing infrastructure. 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 effects. I have previously been engaged to advise Waka Kotahi and Auckland Transport (roads), KiwiRail (railways), Christchurch City Council (airport) and Environment

Canterbury (port) on reverse sensitivity noise issues. I have presented acoustics evidence for Waka Kotahi and KiwiRail on numerous plan changes and plan reviews. I previously drafted potential environmental noise provisions for Clause G6 of the New Zealand Building Code for the Ministry of Business, Innovation and Employment.

1.4 I am convenor of the New Zealand reference group for "ISO" acoustics standards and a member of the joint Australian and New Zealand committee responsible for acoustics standards. I was Chair of the 2012 New Zealand acoustics standards review, Chair for the 2010 wind farm noise standard, and a member for the 2008 general environmental noise standards.

2. CODE OF CONDUCT

2.1 I confirm that I have read the Code of Conduct for Expert Witnesses set out in the Environment Court's Practice Note 2023. I have complied with the Code of Conduct in preparing this evidence and will continue to comply with it while giving oral evidence at the hearing. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

3. SCOPE OF EVIDENCE

3.1 My statement relates to the Noise chapter of the PDP. I have prepared this statement for KiwiRail and Waka Kotahi as the respective requiring authorities for the Main North Line (**"MNL"**) and State Highways 1 and 71 (**"SH1", "SH71"**) and the Woodend Bypass in the Waimakariri District.

3.2 The KiwiRail and Waka Kotahi submissions seek that rules in the notified version of the PDP be amended so that they manage adverse effects caused by new and altered buildings containing noise sensitive activities establishing near existing railway and state highway corridors. The purpose of the provisions sought is to protect the health of occupants of new and altered buildings, and in turn to avoid or mitigate potential reverse sensitivity effects on the operations of KiwiRail and Waka Kotahi.

3.3 My evidence will address:

(a) noise and vibration effects arising from road and rail infrastructure;

(b) methods to manage adverse effects on new and altered buildings containing sensitive activities near existing infrastructure;

(c) controls that are included in the notified version of the PDP;

(d) the appropriateness of the relief sought by KiwiRail and Waka Kotahi from an acoustics and public health perspective; and

(e) the recommendations of the Council officers in the section 42A report in relation to the relief sought by KiwiRail and Waka Kotahi.

4. NOISE AND VIBRATION EFFECTS FROM ROAD AND RAIL INFRASTRUCTURE

4.1 Sound and vibration from road and rail networks have the potential to cause adverse health effects on people living nearby.

Road and rail noise effects

4.2 In respect of noise, this has been documented by authoritative bodies such as the World Health Organisation (**"WHO"**),[1] including a 2018 publication by WHO Europe ("**2018 WHO Guidelines**"), which sets out guidelines for managing environmental noise.[2] These publications are underpinned by extensive research. I am not aware of any fundamental disagreement in the acoustics profession with the information published by WHO regarding road and rail noise effects.

4.3 Research published in 2019 specifically addressed the applicability of international data on road and rail noise annoyance to New Zealand.[3] This included a survey of people living in the vicinity of the North Island Main Trunk line and separately State Highway 1 in South Auckland, using the same general methodology as most international studies. The research found that international noise annoyance response curves are generally applicable for the New Zealand population. I am currently on the steering groups for two other research projects further investigating these issues: "Community response to noise" and "Social (health) cost of land transport noise exposure in New Zealand".[4]

4.4 From preceding studies, the 2018 WHO Guidelines found evidence that road and railway sound cause adverse health effects in that they increase the risk of ischaemic heart disease, hypertension, annoyance and sleep disturbance in the population. Various other potential health effects were examined but evidence was not available to determine a relationship for them with road and railway sound. Based on the information available the 2018 WHO Guidelines made “strong” recommendations that external road and railway sound levels should be reduced below guideline values. The submissions on the PDP by KiwiRail and Waka Kotahi, to include land use controls for new and altered sensitive activities near road and rail corridors, are consistent with

1 World Health Organisation, Guidelines for community noise, 1999; World Health Organisation, Burden of disease from environmental noise, 2011.

2 World Health Organisation, Environmental noise guidelines for the European region, 2018.

3 Humpheson D. and Wareing R., 2019. Evidential basis for community response to land transport noise, Waka Kotahi Research Report 656. https://nzta.govt.nz/resources/research/reports/656/

4 https://www.nzta.govt.nz/planning-and-investment/research-programme/current-research-activity/active-research-projects/

this direction, as an integral part of their broader noise management activities. I describe below some of the steps and actions that Waka Kotahi and KiwiRail implement as part of this management approach.

Rail vibration effects

4.5 Internationally, there has been less research into transportation vibration effects on people compared to research on transportation sound effects. However, the evidence that does exist on adverse health effects caused by rail vibration, such as annoyance and sleep disturbance, indicates they are material, and as such in my opinion the relative paucity of research is not an indicator of the degree of effects. There is international research ongoing in this area, including into the combination of noise and vibration given that both can cause the same adverse health effects.

4.6 With respect to vibration, Norwegian Standard NS 8176[5] provides a summary of annoyance and disturbance relationships associated with vibration from land-based transport. These relationships show that adverse effects occur at vibration exposures typically found around the existing rail network. This primary issue relates to people in dwellings being disturbed due to feeling vibration, but there is also an interrelated issue that the same vibration can cause buildings to radiate noise inside.

5. METHODS TO MANAGE ADVERSE EFFECTS

5.1 I have been involved in different activities undertaken by KiwiRail and Waka Kotahi to manage and reduce sound and vibration where practicable. These include development of quieter road surfaces, installation of ballast mat, installation of noise barriers, rail grinding and tamping, investigation into engine braking noise, and automated monitoring of rolling stock wheel condition. However, even with practicable improvements implemented, the operation of the state highway and railway networks can result in adverse effects which cannot be completely internalised within its typical designation boundaries, such as noise and vibration. These effects commonly occur with the road and railway networks subject to normal maintenance and cannot be solely attributed to defects in road surface, track or rolling stock. In particular, vibration varies significantly depending on ground conditions and localised features such as buried services and structures. Even with "good" ground, track and rolling stock conditions there is still inherent vibration that can cause disturbance to activities in proximity to the rail corridor.

5.2 As these effects cannot be completely internalised within the corridor, in my opinion there must be appropriate land use controls in place to manage sensitive development near these transport corridors. Land use controls to avoid or manage adverse noise and vibration effects on new

5 Norwegian Standard NS 8176:2017 Vibration and shock - Measurement of vibration in buildings from landbased transport and guidance to evaluation of its effects on human beings.

sensitive activities or alterations to such activities are critical in protecting sensitive activities from adverse noise and vibration effects. Such controls, in turn, are fundamental to managing the potential for both health impacts on those located near the rail and road networks, and reverse sensitivity effects on those networks.

5.3 If it is not practicable to avoid sensitive activities near road and rail corridors, for new buildings being constructed, or existing buildings being altered, it is relatively straight-forward to control internal sound and vibration through the building location, design and systems (like acoustic insulation and mechanical ventilation). In most cases, it is practical to achieve acceptable internal sound and vibration levels using such measures. Thus, with careful design of building location, orientation and materials, future occupants of the building can be protected from the most significant adverse effects associated with road and railway sound and vibration.

5.4 Rules in district plans commonly control the location and design of sensitive activities such as housing, where such activities seek to locate near existing sound sources such as roads, railways, airports, ports, quarries, industrial sites, industrial and business zones, gun clubs and motorsport facilities. For new houses near existing roads and railways, examples of second-generation operative district plans containing controls include: Christchurch, Dunedin, Tauranga, Hamilton, Palmerston North, Whangarei and Hutt City. In all these example plans there are requirements to achieve reasonable internal noise levels in sensitive spaces near roads and railways. Other aspects of the controls vary between these plans.

6. NOTIFIED PDP

6.1 In the notified version of the PDP, NOISE-R16 details sound insulation and ventilation requirements for residential units seeking to establish within 80 metres of an arterial road, strategic road (including SH1 and SH71) or rail designation. These provisions partially address the effects I have discussed above, but there are significant gaps in the notified version that would leave people in new and altered buildings exposed to road and rail noise and vibration above guideline values.

6.2 Under the PDP definitions of arterial road and strategic road it appears the Woodend Bypass would not be included in this rule because, while it has a designation, it is not shown as a strategic road on the planning maps.

6.3 NOISE-R16.1 and NOISE-R16.2 offer two alternate means of determining sound insulation requirements. NOISE-R16.1 specifies the same fixed sound insulation performance for all parts of all buildings near roads and railways. Under NOISE-R16.1, the resulting indoor levels will vary depending on the external noise exposure, such that buildings closer to a road or railway will generally have higher indoor levels than those further away. Within individual buildings, spaces facing the road or railway will generally have higher levels than those facing the opposite direction.

In my opinion this is an inefficient and partially ineffective approach to controlling road and railway noise because many parts of buildings are required to provide more sound insulation than needed to achieve appropriate indoor levels, but the most exposed parts may not have sufficient sound insulation.

6.4 NOISE-R16.2 allows the sound insulation performance to be determined based on the actual noise exposure of each façade and building, as required to achieve specified indoor noise. These two alternative options in NOISE-R16.1 and NOISE-R16.2 do not provide the same protection from noise. Under NOISE-R16.1, resulting indoor noise levels are likely to exceed the criteria under NOISE-R16.2 for some buildings with higher external noise exposures.

6.5 NOISE-R16.6 requires alternative means of ventilation where windows need to be closed to achieve indoor road and rail noise criteria. However, there are no air change or temperature parameters specified beyond Building Code minima. Therefore, windows might need to be opened for occupants to be comfortable, which would compromise the sound insulation and could result in excessive indoor noise.

6.6 The notified version of the PDP does not include any controls for new and altered buildings affected by railway vibration.

7. RELIEF SOUGHT

7.1 Waka Kotahi and KiwiRail submitted in support of the inclusion of land use controls for sensitive activities near road and rail corridors, but with amendments to address various gaps identified in the notified provisions.

Activities to be protected

7.2 KiwiRail submitted to amend NOISE-R16 to protect all noise sensitive activities and not just residential activities. There can be adverse impacts on all types of noise sensitive activity and in my opinion, it is appropriate for this rule to manage noise effects on all the activities set out in KiwiRail's submission.

7.3 KiwiRail submitted that NOISE-R16 should apply to new and altered buildings, rather than just new buildings in the notified version. When buildings are being altered, such as extensions or conversions for habitable spaces, I consider it appropriate to design to achieve the same indoor noise criteria to protect health as for new buildings. During construction of both new and altered buildings is the most efficient and effective time to incorporate appropriate noise controls.

Extent of controls for road and rail noise

7.4 Waka Kotahi and KiwiRail both submitted that NOISE-R16 should be amended to apply within 100 metres from state highways and railways rather than 80 metres in the notified version.

7.5 For road noise, I have reviewed noise modelling of the national state highway network conducted by AECOM as part of a research project[6], based on input data reflecting 2020/21 conditions. In that modelling the 54 dB $L_{Aeq(24h)}$ noise contour extends beyond 100 metres along most of SH1 and SH71 in the district, other than where there are lower speeds and/or screening by buildings in Kaipoi, Woodend and Waikuku. Based on NZS 6806[7], a reasonable indoor road noise level is 40 dB $L_{Aeq(24h)}$ and this typically corresponds to outdoor road noise levels of 57 dB $L_{Aeq(24h)}$, with windows ajar for ventilation. Allowing for a 3 dB tolerance in measurements or predictions, I consider the controls should extend to areas predicted to be exposed to outdoor road noise above 54 dB $L_{Aeq(24h)}$. In some areas, such as where there is screening by buildings or the terrain, the modelled distance is less than 100 metres but in most areas, the modelled distance is larger than 100m. Applying land use controls to all areas within 100 metres of state highways would cover the most affected areas.

7.6 For rail noise, the following table provides an illustration of typical railway sound levels based on an assumption of approximately two freight train movements in a one-hour period, in a flat area without screening. This is based on data summarised by Marshall Day Acoustics.[8] More recent (unpublished) measurements for various New Zealand train types confirm these sound levels are in a realistic range. These levels are consistent with the parameters in the notified NOISE-R16.4.

Distance from track	Sound level
10 metres	71 dB $L_{Aeq(1h)}$
20 metres	68 dB $L_{Aeq(1h)}$
30 metres	66 dB $L_{Aeq(1h)}$
40 metres	64 dB $L_{Aeq(1h)}$
50 metres	62 dB $L_{Aeq(1h)}$
60 metres	60 dB $L_{Aeq(1h)}$
70 metres	59 dB $L_{Aeq(1h)}$
80 metres	58 dB $L_{Aeq(1h)}$
90 metres	56 dB $L_{Aeq(1h)}$
100 metres	56 dB $L_{Aeq(1h)}$

7.7 In the Marshall Day Acoustics report which generated the above levels, it was not set out as applying in settings which actually experienced two freight train movements per hour across a day. Instead, the intention of the average is to provide an approximation of both the effects of a single event, and a generalised average of noise from the corridor. The report considered a single measurement would enable simpler application of the rule framework by landowners (compared to an average and maximum approach which was considered to add extra complication without significant benefits in effects management given the variability of single trains passing by).

[6] Social (health) cost of land transport noise exposure in New Zealand, https://www.nzta.govt.nz/planning-and-investment/research-programme/current-research-activity/active-research-projects/

[7] NZS 6806:2010 Acoustics – Road-traffic noise – New and altered roads

[8] Marshall Day Acoustics, *Ontrack rail noise criteria reverse sensitivity guidelines*, 22/10/09

7.8 Based on these indicative external levels, I consider that controls should apply over at least 100 metres from the Main North Line in the Waimakariri District as where external rail noise exposure is over 55 dB $L_{Aeq(1h)}$ it is likely that the indoor criteria in NOISE-R16.2 would be exceeded.

Indoor noise criteria for rail noise

7.9 KiwiRail submitted that the notified provisions should be amended so that rather than specifying two alternative options of either fixed sound insulation (NOISE-R16.1) or indoor noise criteria (NOISE-R16.2), only indoor noise criteria should be specified.

7.10 Using indoor noise criteria requires a site-by-site assessment and tailored mitigation for each development, whereas the fixed sound insulation requires the same mitigation for all developments. Both options under the notified NOISE-R16 require specialist acoustics expertise to apply.

7.11 As I discussed previously, fixed sound insulation requirements result in excess treatment in many cases and inadequate treatment for those developments most exposed (nearest to the railway). Technically, only setting indoor noise limits should be the most efficient and effective approach.

7.12 In the Christchurch District Plan, multiple compliance options were included for mitigating road and rail noise in buildings for new sensitive activities. On review of the controls the Council found that in most cases site-specific assessment of indoor noise was selected by developers rather than fixed sound insulation.[9] This was presumably as the site-specific assessment provided a more efficient solution. The Council also reported that inclusion of multiple options had caused confusion for both plan users and administrators.

7.13 Using indoor noise limits allows account to be taken of the specific external noise exposure of each building, room and façade, and allows for the most efficient design option to be adopted. In my opinion this approach is also preferable for road noise as it has similar characteristics in this respect.

Ventilation requirements

7.14 KiwiRail submitted that requirements for ventilation with windows closed should provide appropriate air flow and thermal comfort so that windows do not need to be opened. The submission also seeks inclusion of requirements for user controls and limitations on ventilation system self-noise.

[9] Christchurch District Plan, Plan Change 5E

Rail vibration controls

7.15 KiwiRail submitted to amend NOISE-R16 to include a maximum rail vibration criterion of 0.3 mm/s $v_{w,95}$ inside buildings for sensitive activities. This criterion corresponds to exposure where about 20% of people would be expected to be highly or moderately annoyed by vibration. I consider 0.3 mm/s $v_{w,95}$ to be a minimum standard that should be achieved in new buildings near railways for reasonable protection from adverse health effects.

7.16 Railway vibration is generally subject to greater variability between locations than noise, due to complex interactions between localised track/ground conditions and buildings. As an indication, the following table summarises various railway vibration measurements (and associated predictions) in New Zealand from a range of sources, generally ordered from lowest to greatest magnitude (other than the first row which uses the ppv metric rather than $v_{w,95}$). Where the data relates to a private development or complaint, a generic source reference is given. Not all measured values are directly comparable due to issues such as differences in measurement positions (ground/building) that would require adjustments.

Data source	Vibration levels
Marshall Day Acoustics, *Ontrack rail noise criteria reverse sensitivity guidelines*, 22/10/09 *(secondary reporting of Marshall Day Acoustics 2006 assessment for Marsden Point)*	Based on measurements: 2 to 3 mm/s ppv at 30m 0.5 to 1 mm/s ppv at 60m
AECOM, *Bayfair to Bayview – Rail Relocation Post Construction Noise and Vibration Monitoring*, 6/3/17	Measured: 0.56 mm/s $v_{w,95}$ at 7m From measurement and distance correction: 0.19 mm/s $v_{w,95}$ at 100m 0.26 mm/s $v_{w,95}$ at 50m 0.37 mm/s $v_{w,95}$ at 25m
Marshall Day Acoustics, *Wiri to Quay Park third main rail line noise and vibration assessment*, 10/7/20	Measured: 0.6 mm/s $v_{w,95}$ at 9.5m
URS, *Maunganui-Girven Road Intersection -Rail Vibration Assessment*, 14/4/14	Measured: 26.5 mm/s^2 $a_{w,95}$ at 17m *(this $a_{w,95}$ value has different units and is not directly comparable to a $v_{w,95}$ value)* From measurement and distance correction: 0.34 mm/s $v_{w,95}$ at 100m 0.47 mm/s $v_{w,95}$ at 50m 0.67 mm/s $v_{w,95}$ at 25m
URS, *Operational noise and vibration assessment Peka Peka to North Ōtaki Expressway Project*, 12/2/13	Measured: 0.58 mm/s $v_{w,95}$ at 60m
Marshall Day Acoustics, *assessment in relation to a complaint near Hamilton*, 28/11/12	Measured (on a deck structure): 0.42 mm/s $v_{w,95}$ at 140m
Marshall Day Acoustics, *assessment for development in Napier*, 6/2/20	Measured: 1.2 mm/s $v_{w,95}$ at 10m
URS, *Ground-borne vibration measurements at Hornby, Christchurch,* 12/9/14	Measured before renewal: 2.2/2.9 mm/s $v_{w,95}$ at 8.4m Measured after renewal: 0.5/0.4 mm/s $v_{w,95}$ at 8.4m

7.17 The data in the above table illustrates the significant variation that is inherent in railway vibration. With respect to the criterion of 0.3 mm/s $v_{w,95}$, the measurement data shows that this criterion can routinely be exceeded at over 100 metres from railway tracks in New Zealand, but there is significant variation. Vibration levels exceeding this criterion occur beyond 60 metres from the track in most cases.

7.18 For application of land use controls, from a technical perspective it would be preferable to assess all sites within 100 metres or more of rail corridors. However, KiwiRail has limited proposed controls to 60 metres in its submission on a pragmatic basis, also in recognition of the significant variability in vibration levels.

7.19 The KiwiRail submission seeks an option in the proposed vibration provisions to use a construction specification for a vibration isolation bearing. This can be applied for simple buildings (i.e. single-storey framed residential buildings) as an alternative to conducting a site/building specific assessment. From a technical perspective, I recommend a site-specific assessment in all instances due to the variability of vibration and building designs. As such, I consider the construction specification part of the proposed rule could be omitted. However, if a compliance option is desired that does not require site-specific assessment, then the construction specification should provide reasonable vibration isolation such that vibration inside most buildings is likely to be less than 0.3 mm/s $v_{w,95}$.

8. SECTION 42A REPORT

8.1 Ms Manhire has relied on the technical evidence of Stuart Camp dated 17 July 2023. I will address matters Mr Camp raises relating to NOISE-R16 for road and rail noise and vibration.

Uncertainty of road noise measurements and predictions

8.2 In paragraph 43 of his evidence Mr Camp discusses the 2 dB allowance required under the notified NOISE-R16 to be applied in road noise calculations. Mr Camp correctly notes that Waka Kotahi normally seeks the requirement to be 3 dB rather than 2 dB. Mr Camp discusses this in the context of traffic growth and I agree with him that 3 dB would generally be an excessive allowance for traffic growth. However, that is not the sole basis for Waka Kotahi seeking that value. The most significant factor is the inherent uncertainty in all sound level measurements and predictions. In reality, the uncertainty from all relevant factors exceeds 3 dB, but in my opinion this is a pragmatic compromise value that should be used to avoid inadequate sound insulation leading to indoor noise levels above the criteria.

Extent of controls for road and rail noise

8.3 In paragraphs 44 to 48 of his evidence Mr Camp discusses the submissions seeking to extend the area of controls from 80 metres from 100 metres.

8.4 In terms of noise exposure, Mr Camp appears to agree that for road noise a greater distance than 80 metres might be appropriate, but for rail noise it appears not. For both road and rail noise Mr Camp notes that technical information from Waka Kotahi and KiwiRail is based on distances from the carriageway or track, rather than distances from the designation. I agree with Mr Camp and confirm that the road and rail noise levels (and rail vibration levels) I have set out in Section 7 are based on distances from carriageways or tracks.

8.5 Mr Camp considers that in NOISE-R16 it would be more practical to define distances from designation boundaries rather than from carriageways and tracks. This is a planning rather than acoustics matter, but in my experience both approaches have commonly been used in different district plans. An advantage of specifying a distance from a designation boundary is that it could also include unimplemented designations such as the Woodend Bypass.

8.6 Mr Camp states that for some busier roads in the district, 80 metres from a designation boundary is very similar to 100 metres from a carriageway. I have made numerous spot checks of the distances between state highway carriageways and designation boundaries throughout the district and have only found an approximately two kilometre long stretch of SH1 where this assumption would be robust. For the majority of SH1 and SH71, 80 metres from the designation boundary would be less than 100 metres from the carriageway. Given that the 100 metres itself is a compromise value, controls are still warranted if the area of application is defined as 100 metres from the road designation boundary.

8.7 The rail corridors are narrower, and I have not found any sections where the separation between the track and both sides of the designation boundary is at least 20 metres. The designation itself is generally less than 20 metres wide. Mr Camp recommends maintaining rail noise controls over 80 metres from designation boundaries for consistency and considering the small number of trains. I understand that the Main North Line is an important freight route that currently has regular movements with growth likely, considering matters such as the forthcoming increase in rail ferry capacity. As such, I consider the rail noise levels I have set out in Section 7 are an appropriate basis for controls, and these levels are already specified through the parameters in the notified NOISE-R16.4. On this basis I consider the distance used should be 100 metres from the track or designation boundary. To use a lesser distance would be inconsistent with NOISE-R16.4.

Indoor noise criteria

8.8 In paragraphs 52 to 56 of his evidence Mr Camp discusses alternative compliance options. For the reasons I have set out in Section 7, I disagree with Mr Camp that it is desirable to have alternative options of fixed sound insulation or indoor noise criteria. I acknowledge that Mr Camp is referring to essentially a third compliance option of a new construction specification rather than the existing sound insulation requirement, but this still results in a “one-size-fits-all” which is likely to provide inadequate protection in some locations and excess in others.

8.9 In paragraph 53 of his evidence Mr Camp discusses the need for specialist assessment. Mr Camp does not specify, but I assume he means that no specialist assessment would be needed if a new construction specification were introduced. However, under the notified provisions specialist assessment would be required under both options in NOISE-R16.1 and NOISE-R16.2.

8.10 In paragraph 54 of his evidence Mr Camp comments on the Christchurch Plan Change 5E. He implies there will be increased cost from simplifying previous compliance options in that district plan. As I discussed in paragraph 7.12, the Christchurch City Council undertook extensive analysis of how the previous rule with options had functioned over several years and found that the clear majority of applicants chose to use the indoor noise criteria as the most efficient option. Odd instances where fixed sound insulation had been selected are likely to have been in higher noise exposures where it could provide inadequate protection.

Rail vibration controls

8.11 Mr Camp does not address rail vibration controls in his evidence. In paragraph 281 of her report Ms Manhire refers to previous advice that *"…vibration rules are expensive and difficult to implement…"* and also notes that Council has no means to measure vibration itself. I agree that assessment and design to control vibration can be complex and relatively expensive. However, based on the evidence of typical rail vibration exposures and potential adverse health effects, in my opinion controls are required if introducing new and altered sensitive activities to this environment. I am unaware of any Councils with equipment and expertise for measuring or assessing rail vibration. Under the amendments to NOISE-R16 proposed by KiwiRail, developers would be responsible for engaging suitably qualified specialists to provide a design report demonstrating compliance with the vibration criterion.

9. CONCLUSIONS

9.1 Noise and vibration from road and rail corridors can give rise to adverse health effects on sensitive land uses located nearby. The research and guidelines relating to these effects are widely accepted internationally and applied in New Zealand.

9.2 Waka Kotahi and KiwiRail continuously work to reduce existing noise and vibration exposure and to manage the effects of their operations on existing sensitive activities. However, due to the nature of their operations, Waka Kotahi and KiwiRail (as with many large infrastructure providers) are unable to internalise all noise and vibration effects associated with their activities.

9.3 Adverse effects on new and altered buildings for sensitive activities can be avoided and managed through well understood controls in district plans. Waka Kotahi and KiwiRail made submissions on the PDP seeking amendments to address gaps in controls included in the notified provisions.

I consider that the relief sought by Waka Kotahi and KiwiRail as refined in Appendix A to the evidence of Catherine Heppelthwaite appropriately address these issues.

Stephen Chiles
4 August 2023