Before Independent Hearing Commissioners
In Porirua

Under	the Resource Management Act 1991 ('**RMA**')
In the matter of	of a submission by NZ Transport Agency (Waka Kotahi) (submitter 82, further submitter 36) on the Proposed Porirua District Plan

Statement of evidence of Stephen Gordon Chiles for Waka Kotahi – Noise and Vibration

21 January 2022

1 Qualifications and experience

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, Fellow of the UK Institute of Acoustics and Member of the Resource Management Law Association.

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, a consultant for the international firms Arup, WSP, and URS, and for the specialist firms 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 regional public health services.

1.3 I have been involved in a wide variety of work assessing noise and vibration effects on new or altered sensitive activities around existing established 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 reverse sensitivity effects in relation to noise. I have previously been engaged to advise Auckland Transport (roads), KiwiRail (railways), Christchurch City Council (airport) and Environment Canterbury (port) on reverse sensitivity noise issues.

1.4 I jointly led the review of Waka Kotahi's reverse sensitivity policy for state highways and development of its current guide.[1] I also provided technical input and assisted in developing the Section 32 analysis attached to the evidence of Ms Heppelthwaite. I have presented acoustics evidence for Waka Kotahi on numerous plan changes and plan reviews, with recent and current work including Waikato, Selwyn, New Plymouth, Wellington and Whangarei district plans. I advised Waka Kotahi with respect to draft provisions for a potential National Planning Standard addressing adverse effects on new sensitive land uses or alterations to existing uses, near road corridors. I was previously 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.

1.5 I am convenor of the New Zealand reference group for "ISO" acoustics standards, an observer of the "IEC" committee for acoustics instrumentation standards and a member of the joint Australian and New Zealand committees responsible for

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

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 Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2014. 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 Proposed Porirua District Plan ('**Proposed Plan**'), and in particular to Waka Kotahi's function as a transport network utility operator in the Porirua District.

3.2 I have prepared a separate statement of evidence for KiwiRail addressing the same issues with respect to railway noise and vibration. Given the commonality of the issues and the unified approach of Waka Kotahi and KiwiRail, I have often prepared combined evidence on behalf of both parties. However, in this instance and in response to the notified version of the Proposed Plan, each party sought slightly different relief. While technically these are still aligned, I have addressed each in a separate statement of evidence. Due to the commonality of issues, there is duplication between my two statements of evidence.

3.3 In my opinion, amended rules need to be included in the Proposed Plan to manage adverse effects caused by new and altered buildings containing sensitive activities establishing near existing state highway corridors. The purpose of these provisions is to protect the health and amenity of occupants of those buildings, and to avoid or mitigate potential reverse sensitivity effects on those transport corridors.

3.4 My evidence relates to the management of road-traffic noise and vibration effects with respect to public health and amenity. It will address:

a noise and vibration effects arising from road infrastructure;

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

c the appropriateness of the relief sought by Waka Kotahi from an acoustics and public health perspective; and

d the recommendations of the Council Officer in the Section 42A report.

3.5 I have prepared my evidence based on my experience assessing and managing future and existing state highway sound and vibration at numerous locations throughout New Zealand.

3.6 My evidence should be read alongside that of Ms Catherine Heppelthwaite for Waka Kotahi (planning).

4 Summary of evidence

4.1 Sound and vibration from road corridors can give rise to adverse health and amenity effects on sensitive land uses located nearby. The research and guidelines relating to these effects are widely accepted internationally and applied in New Zealand. In terms of noise effects, the literature includes findings from the World Health Organisation (**'WHO**') and recent research verifying international annoyance responses for the New Zealand population. Responses to road vibration are documented in an overseas standard.

4.2 Waka Kotahi continuously works to reduce existing sound and vibration exposure and to manage the effects of their operations on existing sensitive activities. However, due to the nature of its operations, Waka Kotahi is unable to internalise all noise and vibration effects associated with its activities.

4.3 Adverse effects on new and altered buildings for sensitive activities can be avoided and managed through well understood controls that are common in district plans, including in specific locations under the operative Porirua District Plan ('**Operative Plan**'). In my opinion, it is therefore critical that the Proposed Plan includes appropriate land use controls to manage the location of sensitive activities near road corridors, to protect these users from adverse health and amenity effects.

4.4 The notified version of the Proposed Plan does contain some relevant controls, but in my opinion these do not go far enough to protect human health. The Waka Kotahi submission sought more comprehensive controls that in my opinion would better address the spatial extent of effects, effects in outdoor as well as indoor

spaces and effects in a wider range of sensitive spaces. The submission also proposed ventilation requirements to provide a choice to keep windows closed and inclusion of a tolerance in sound insulation design.

4.5 The Section 42A report recommended further diminishing the notified provisions such that they would allow for even greater adverse health effects to arise. The Section 42A report noted some practical difficulties with the format of controls proposed by Waka Kotahi. In my opinion, these matters do not override the need for controls on sensitive activities locating near existing highways, and I consider that technically the controls proposed by Waka Kotahi can be effectively reframed and streamlined to fit within the notified rule structure. I have worked with Ms Heppelthwaite to address the issues raised in the Section 42A report with a refined version of the amendments sought by Waka Kotahi.

4.6 In my opinion, the amendments to the provisions as set out in the attachment to the evidence of Ms Heppelthwaite, seek appropriate and pragmatic rules that would manage the most significant adverse effects on new and altered sensitive activities near existing road corridors.

5 Noise and vibration effects from road infrastructure

5.1 It is widely accepted nationally and internationally that sound and vibration from road networks have the potential to cause adverse health and amenity effects on people living nearby. This has been documented by authoritative bodies such as the World Health Organisation ('**WHO**'),[2] including a relatively recent publication by WHO Europe in October 2018 ('**2018 WHO Guidelines'**), which sets out guidelines for managing environmental noise.[3] These WHO publications are underpinned by robust scientific research. I am not aware of any fundamental disagreement in the acoustics profession with the information published by WHO regarding road noise effects.

5.2 A research project was published in 2019 specifically addressing the applicability of international data on noise annoyance to New Zealand.[4] This research included a survey of many residents living in the vicinity of an existing state highway using the questions and methods set out in the international technical specification ISO/TS 15666,[5] which is the same approach used in most

[2] World Health Organisation, Guidelines for community noise, 1999; World Health Organisation, Burden of disease from environmental noise, 2011.
[3] World Health Organisation, Environmental noise guidelines for the European region, 2018.
[4] 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/.
[5] International Standards Organisation ISO/TS 15666:2003 Acoustics – assessment of noise annoyance by means of social and socio-acoustic surveys.

international studies. The research found that international noise response curves are generally applicable for the New Zealand population, although potentially, the New Zealand population may be slightly more noise sensitive. 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"*.

5.3 The 2018 WHO Guidelines are based on a critical review of academic literature and followed a rigorous protocol to determine the quality of evidence of adverse effects. With respect to sound from road networks, the 2018 WHO Guidelines note the following adverse effects: ischaemic heart disease, hypertension, high annoyance, and sleep disturbance. Based on the strength of the evidence of adverse effects, WHO makes recommendations to policymakers to reduce road sound exposure to below a range of guideline values. The relief sought by Waka Kotahi on the Proposed Plan is consistent with this direction, as an integral part of their broader noise management activities. I describe below some of the steps and actions that Waka Kotahi implements as part of this management approach.

5.4 With respect to vibration, Norwegian Standard NS 8176 provides a summary of annoyance and disturbance relationships associated with vibration from land-based transport. [6] These relationships show that adverse effects occur at vibration exposures typically found around existing road networks. This primary issue relates to people in buildings being disturbed due to feeling vibration, but there is also an interrelated issue that the same vibration can cause buildings to radiate noise inside.

5.5 Where these adverse noise and vibration effects are not adequately managed, consequential reverse sensitivity effects on Waka Kotahi could arise in addition to health effects on residents.

6 Methods to manage adverse effects

6.1 Adverse effects from road sound and vibration can occur at many existing properties located near state highway networks throughout New Zealand. I have previously been, and am currently involved in, numerous different activities undertaken by Waka Kotahi to manage and reduce this sound and vibration where practicable. These include development of quieter road surfaces, installation of noise barriers, investigation into engine braking noise, and repair of road surfaces to address vibration issues. For new or altered roads, Waka Kotahi

[6] Norwegian Standard NS 8176:2017 Vibration and shock - Measurement of vibration in buildings from land based transport and guidance to evaluation of its effects on human beings.

seeks to apply NZ 6806, which provides guidance on the assessment of noise, recommended noise criteria and potential mitigation measures.[7] However, practicable improvements are often constrained, and the operation of the state highway networks can result in effects which cannot be internalised, such as noise and vibration.

6.2 For new buildings being constructed, or existing buildings being altered, near to the state highway networks, 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. Likewise, screening can be used in some cases to achieve reasonable external sound levels, which is important to provide for outdoor amenity associated with normal domestic activity. 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 state highway sound and vibration.

6.3 Land use controls to avoid or manage adverse noise and vibration effects on new sensitive activities or alterations to such activities, are critical in protecting sensitive activities from adverse noise and vibration effects as these effects cannot be internalised.

6.4 Such controls are common in most district plans I am familiar with throughout the country, including in the Operative Plan. In the Operative Plan there are limits for road-traffic noise from the Transmission Gully motorway (SH1) in rules D5.3.2.5 and D5.3.3.5 for new houses in the Judgeford Hills Zone Clusters D and E. There are also limits for road-traffic noise from St Andrews Road (SH59) in rule $NOISE_{PFZ}$-R3 and $NOISE_{PFZ}$-S2/S3/S4 for new houses in the Plimmerton Farm Zone.

6.5 Rules in other 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, examples of second generation operative district plans containing controls include: Christchurch, Dunedin, Tauranga, Hamilton, Palmerston North and Hutt City. In all these example plans, there are requirements to achieve reasonable internal noise levels in sensitive spaces near roads. Other aspects of the controls vary between these plans.

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

6.6 In the case of the Proposed Plan, there are controls in NOISE-R5 and NOISE-S1/S3/S4 for new and altered buildings near all State Highways. These controls set an internal road-traffic noise limit (S1), ventilation requirements (S3) and a vibration limit (S4). The internal road-traffic noise limit and ventilation requirements apply within 80 metres of a state highway with a speed limit above 60 km/h, and within 50 metres where the speed limit is below 60 km/h. Additionally, the vibration limit applies within 40 metres and 20 metres of a state highway with a speed limit above and below 60 km/h respectively. The provisions are similar to those in the Operative Plan for the Plimmerton Farm Zone.

7 Waka Kotahi submission and response to Section 42A report

7.1 The rules in the notified version of the Proposed Plan NOISE-R5, and associated standards NOISE-S1/S3/S4, are similar to provisions typically sought by Waka Kotahi in other plans. However, there are several areas where I consider the version in the Proposed Plan does not adequately protect new and altered noise sensitive activities near state highways.

7.2 The submission of Waka Kotahi sought new rules in place of NOISE-R5 and associated standards, based on provisions previously developed by Waka Kotahi. While Waka Kotahi sought to replace the notified provisions with new wording, the following aspects of the notified provisions are the same as that sought by Waka Kotahi:

a Controls apply within a specified distance of state highway traffic lanes;

b There is a primary performance standard inside habitable rooms of 40 dB $L_{Aeq(24h)}$;

c There is a requirement for mechanical ventilation if windows need to be closed to meet the noise limit;

d There is a vibration limit of 0.3 mm/s $v_{w,95}$ (Class C from NS 8176); and

e Compliance is demonstrated by a design report/certificate prior to construction.

7.3 In terms of technical acoustics details, the main issues addressed by the provisions sought by Waka Kotahi, compared to the notified provisions are:

a Controls apply over a distance of 100 metres from state highways, better covering the area over which adverse effects are most likely, but combined

with a noise level criterion (57 dB $L_{Aeq(24h)}$) to minimise unnecessary application;

b Outdoor noise is controlled by a requirement for screening by a noise barrier blocking line-of-sight to the road;

c Noise limits are specified for a range of noise sensitive spaces and not just habitable rooms;

d Mechanical ventilation is required to maintain temperature in a specific range and to provide significantly increased airflow to provide better thermal comfort; and

e A 3dB tolerance is specified for design reports to allow for uncertainty and changes to road noise such as through resurfacing and traffic growth.

7.4 The Waka Kotahi submission has been reviewed for the Council by Mr Nigel Lloyd.[8] Mr Lloyd and in turn Mr Smeaton in the Section 42A Report recommend rejection of Waka Kotahi's submission points on this matter, and in fact recommend removing some protections provided by the notified rule NOISE-R5 in response to the submission by Kāinga Ora (for example, deletion of NOISE-S4 vibration control). This appears to be partly because Mr Lloyd disagrees with the technical basis for the notified rule and Waka Kotahi submission, and partly because Mr Smeaton considers the rules proposed by Waka Kotahi are not drafted in the format of the plan and are not supported by a Section 32AA evaluation.

7.5 As noted above, a Section 32AA analysis supporting the Waka Kotahi submission is attached to the evidence of Ms Heppelthwaite. On reflection, Ms Heppelthwaite and I considered it would be easier for Council if we worked our proposed amendments into the format of the proposed plan provisions. I discuss below the amended relief now sought by Waka Kotahi, adopting the format of the plan and omitting some of the amendments previously sought by Waka Kotahi.

7.6 In terms of the technical issues raised by Mr Lloyd there are a number of areas where we appear to have different opinions as I will set out for each aspect as follows.

[8] Statement of evidence of Mr Lloyd dated 1 December 2021, as attached to the Section 42A report by Rory Smeaton dated 3 December 2021.

Distance for application of controls

7.7 The origin of the distances specified in the notified version of NOISE-R5 is unclear. In Mr Lloyd's letter dated 10 June 2020 he states that "…the 100 metre distance is appropriate for State Highways where the speed limit is 100 km/h…". I agree, because although the noise footprint will often extend beyond 100 metres, this represents a pragmatic distance that captures areas where the worst adverse effects are likely to occur. [9] However, the notified NOISE-R5 has a maximum distance of 80 metres, for all speeds over 60 km/h including 100km/h, which does not extend as far as the 100 metres that is seemingly agreed between Mr Lloyd and myself. There is no justification provided for the 80 metre distance in Mr Lloyd's evidence or the Section 42A report and potentially it has been erroneously copied from other districts that have lower traffic flows on state highways.[10]

7.8 In his June 2020 letter, Mr Lloyd also states that "…50 metres is a reasonable distance for the Noise Effects Area where the speed limit is equal to or less than 60 km/hr". The justification for this appears to be partly that levels will reduce slightly with slower traffic, but also an assumption that there may be screening by buildings or topography. I have examined previous noise modelling for the two sections of SH59 that currently have a 50 km/h speed limit (Plimmerton and Pukerua Bay) and I agree with Mr Lloyd that a 50 metre distance for controls is reasonable in these areas.

7.9 In the Section 42A report Mr Smeaton refers to Mr Lloyd considering 80 km/h (not 60 km/h) to be an appropriate threshold, but proposes to define this as 70km/h or more. While there is no evidence to support that particular speed threshold in terms of noise effects, in practice I agree that 70km/h provides a reasonable delineation between the 50 km/h areas and the 80/100 km/h areas.

7.10 The Waka Kotahi submission proposed a 100 metre distance in all areas, but with controls only applying where a level of 57 dB $L_{Aeq(24h)}$ is exceeded. Mr Lloyd has raised difficulties in the use of noise modelling information held externally by Waka Kotahi. From a technical perspective I consider it most efficient to use existing noise modelling data where available. However, most plans I am familiar with use fixed distances alone and in my opinion this provides an effective control. I continue to support the use of the 100 metre distance for areas with a speed limit of 70km/h or more, even if this is not refined through noise modelling.

[9] Letter dated 10 June 2020 providing advice to Porirua City Council on the management of reverse sensitivity effects on state highways and rail lines.
[10] For example, distances of 80 metres are used in parts of the operative Palmerston North and Whanganui district plans.

Outdoor noise levels/noise barriers

7.11 Waka Kotahi sought to introduce a requirement for outdoor living areas to be screened from state highways. In paragraph 20 of his evidence Mr Lloyd disagrees on the basis that, *"The spaces to the rear of dwellings are normally screened from traffic noise and this provides an appropriate aural amenity area. This is a natural function of dwelling design and site layout."* This is essentially the outcome that the provision sought by Waka Kotahi is trying to achieve, in that ideally the site and dwelling layout provide an outdoor living area screened from the state highway. Recognition of the importance of outdoor amenity of occupants is also provided in Policy NOISE-P4(1). I disagree with Mr Lloyd that this occurs automatically or normally. In my experience (and from inspection of aerial photographs of houses near SH59), this often does not occur due to constraints on driveway access and orientation for sunlight. Therefore, I consider it appropriate that if a building or terrain does not screen an outdoor living area, it is appropriate to require screening by a noise barrier.

7.12 The Waka Kotahi provisions sought to include a control for outdoor noise in terms of physical screening that can be verified without specialist acoustics assessment. Technically, the alternative of specifying an outdoor noise limit might allow for minimised screening in some circumstances but requires specialist assessment. To avoid the issues raised by Mr Lloyd, I recommend an outdoor noise limit.

Indoor noise limits

7.13 In paragraph 27 of his evidence, Mr Lloyd considers that the indoor noise limits proposed by Waka Kotahi could be used, but he also considers the notified version to be appropriate. It appears that Mr Lloyd and I generally agree on the standards to be achieved, but in my opinion the drafting of the notified version of NOISE-S1 does not give effect to that intent because the noise limits in NOISE-S1 only apply to "habitable rooms" and "places of worship and marae". Neither of these categories include libraries, clinics, consulting rooms, operating theatres, and potentially hospital wards, which are all noise sensitive spaces that also warrant protection. If the format of the notified version of NOISE-S1 is retained, I support the amendments within Attachment A of Ms Heppelthwaite's evidence so that noise limits apply to all noise sensitive spaces set out in the Waka Kotahi submission.

Ventilation

7.14 Mr Lloyd and in turn Mr Smeaton recommend rejecting Waka Kotahi's submission to require mechanical ventilation with a specified temperature range and an increased airflow. Mr Lloyd considers that reliance should be placed on clause G4 of the NZ Building Code.

7.15 I managed a review of this issue for Waka Kotahi, conducted by Acoustic Engineering Services,[11] and have previously managed related investigations by Beca.[12,13] From this evidence, I consider that an air flow rate of 6 air changes per hour (this is significantly higher than the notified requirements), and a temperature range should be specified. Based on the information from Beca, clause G4 does not serve this function and would not provide residents with adequate thermal comfort, such that they would need to open windows.

7.16 In effect, with the notified version of NOISE-S3, residents would either have thermal discomfort with windows closed or excessive noise with windows open. As such, the sound insulation requirement is nullified and residents would be exposed to sound at levels that would result in adverse health effects. The Waka Kotahi provisions are designed to provide thermal comfort so that residents have a genuine choice whether or not to open windows. This allows residents to control indoor sound levels so they can have acceptable conditions at times such as when they are seeking to sleep, rest or concentrate. I therefore recommend amendment of NOISE-S3 to specify increased air flow requirements and a temperature range.

Vibration

7.17 The notified version of NOISE-S4 contains a vibration standard for new sensitive activities near state highways. Mr Lloyd discusses various issues around the vibration standard and in paragraph 43 of his evidence states that he considers a vibration standard is not an efficient use of resources.

7.18 Historically, Transit New Zealand sought to avoid sensitive activities in the area nearest to state highways.[14] In terms of vibration from road-traffic, that approach

[11] Acoustic Engineering Services, NZTA Ventilation specification review, 30 June 2020, https://nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Research-and-information/Other-research/ventilation-specifications-for-acoustic-treatment-june-2020.pdf.
[12] Beca, Ventilation Systems Installed for Road-traffic Noise Mitigation, 26 June 2014. https://nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Research-and-information/Other-research/Ventilation-systems-installed-for-road-traffic-noise-mitigation.pdf.
[13] Beca, New Zealand Transport Agency Building Acoustic Mitigation Case Study, 9 December 2013, https://nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Research-and-information/Other-research/NZ1-8305016-Building-Acoustic-Mitigation-Case-Study.pd.
[14] Transit Planning Policy Manual Appendix 5D – Reverse sensitivity, 1 August 2007.

is effective at avoiding adverse health effects on people. This type of approach is still used to address the high noise exposures at many ports and airports in New Zealand, whereby noise sensitive activities are often prohibited. However, I understand that from an integrated planning perspective it is desirable to allow for people to live near state highways and it is undesirable to 'sterilise' land particularly through urban centres. Therefore, Waka Kotahi generally supports sensitive activities being permitted at all distances from state highways, provided adverse effects can be managed. While Mr Lloyd discusses some difficulties with implementing vibration controls, in my opinion this is a necessary consequence of permitting sensitive development in areas compromised by existing vibration.

7.19 Mr Lloyd appears to accept the vibration criterion proposed by Waka Kotahi, which is in accordance with a recognised standard (NS 8176) that has been widely used throughout New Zealand. The criterion proposed does not provide absolute protection but is set at a level whereby NS 8176 estimates that 20% of people would be expected to be highly or moderately annoyed by vibration. While this degree of residual adverse health effect is undesirable, I propose this threshold as a pragmatic control to address the most severe effects on a community basis. An alternative of seeking avoidance of all effects, or only negligible residual effects, would require vibration controls over a wider area and I anticipate it would require more significant modifications to new building designs. With the criterion proposed, some buildings may be found not to require any treatment. In other cases, modification to foundation designs or building layouts might be required, and for the highest vibration exposures base isolation may be required if the site layout cannot be adjusted.

7.20 Mr Lloyd discusses vibration issues relating to road surface condition. From investigating complaints, I have found that issues often arise from buried services and irregularities in pavements. In my experience vibration can arise from state highways subject to normal maintenance within accepted surface condition parameters. As such, I consider that a control for new sensitive activities is required to manage adverse vibration effects on people.

8 Relief sought

8.1 From reviewing the Section 42A report, Waka Kotahi has now refined the relief sought to fit with the plan format and addresses some of the issues raised by Mr Lloyd and Mr Smeaton. These refined provisions work within the framework of NOISE-R5 and NOISE S1/S3/S4 and are attached to the evidence of Ms Heppelthwaite. Those provisions omit some elements of the original Waka Kotahi submission but retain other aspects as I have discussed above.

8.2 On the basis of the amended provisions attached to Ms Heppelthwaite's evidence, in my opinion the relief sought by Waka Kotahi should result in new and altered buildings near state highways that provide people with acceptable indoor living conditions. This should manage adverse health and amenity effects experienced by those people to a reasonable degree, which in turn would assist in managing potential reverse sensitivity effects on Waka Kotahi.

Stephen Gordon Chiles

21 January 2022