**BEFORE INDEPENDENT HEARING COMMISSIONERS**
**IN CHRISTCHURCH**

**TE MAHERE Ā-ROHE I TŪTOHUA MŌ TE TĀONE O ŌTAUTAHI**

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

**AND**

**IN THE MATTER** of the hearing of submissions on Plan Change 14 (Housing and Business Choice) to the Christchurch District Plan

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# STATEMENT OF PRIMARY EVIDENCE OF JEREMY WILLIAM TREVATHAN ON BEHALF OF CHRISTCHURCH CITY COUNCIL

## ACOUSTICS

## QUALIFYING MATTER: RESIDENTIAL / INDUSTRIAL INTERFACE

Dated: 11 August 2023

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## EXECUTIVE SUMMARY

1. My full name is **Jeremy William Trevathan**. I am employed as the Principal Acoustic Engineer at Acoustic Engineering Services Limited (**AES**).

2. I have prepared this statement of evidence on behalf of the Christchurch City Council (the **Council**) in respect of matters arising from the submissions and further submissions on Plan Change 14 to the Christchurch District Plan (the **District Plan**; **PC14**).

3. The District Plan noise limits which control the Industrial-Residential interface are in line with best practice and put the onus on Industrial operators to comply with 'residential level' limits by the time their noise reaches residential areas.

4. The upper levels of new three storey houses which would be enabled by PC14 may overlook industrial areas, whereas before lower houses were screened. In that situation, the upper façade would now become a compliance assessment location. If noise levels exceeding the District Plan limits were received at that upper façade because it had more direct line of sight to Industrial activities, it is not clear how the situation would be resolved.

5. My modelling indicates that a 40-metre buffer zone is a reasonable response to address a scenario where single level dwellings neighbouring an Industrial area were replaced with three or four level dwellings. Within the buffer zone, potential taller dwellings should be reviewed on a case-by-case basis.

6. I support the Qualifying Matter described in the evidence of Ms Brittany Ratka which was drafted based on my review and analysis. I have reviewed the submissions which raised technical acoustics matters in relation to the proposed Qualifying Matter, but do not recommend any changes to the Plan Change as a result.

## INTRODUCTION

7. My full name is **Jeremy William Trevathan**. I am the Principal Acoustic Engineer and Managing Director of AES, an acoustic engineering consultancy with offices in Auckland, Wellington and Christchurch.

## QUALIFICATIONS AND EXPERIENCE

8. I hold the degrees of Bachelor of Engineering with Honours and Doctor of Philosophy in Mechanical Engineering from the University of Canterbury. I am an Associate of the New Zealand Planning Institute, and a Member of the Acoustical Society of New Zealand (**ASNZ**). I am the AES Member Representative for the Association of Australasian Acoustical Consultants (**AAAC**), a judge for the Association of Consulting Engineers of New Zealand (**ACE NZ**) Innovate Awards, and a member of the MBIE College of Assessors. I was a member of the ASNZ working group advising the Ministry for the Environment (**MfE**) regarding the National Planning Standards (2019).

9. I have more than seventeen years' experience in the field of acoustic engineering consultancy and have been involved with a large number of environmental noise assessment projects throughout New Zealand. I have provided expert evidence before Council Hearings Panels, the Environment Court and Boards of Inquiry.

10. In preparing this evidence I have reviewed the 12 submissions Council received relating to the Industrial – Residential Interface Qualifying matter (numbered S2, S116, S175, S212, S243, S399, S689, S734, S823, S834, S853, S902).

11. I am authorised to provide this evidence on behalf of the Council.

## CODE OF CONDUCT

12. While this is a Council hearing, I have read the Code of Conduct for Expert Witnesses (contained in the 2023 Practice Note) and agree to comply with it. Except where I state I rely on the evidence of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

## SCOPE OF EVIDENCE

13. My statement of evidence addresses the following matters:

    (a) Summary of review and analysis undertaken with regard to the Industrial – Residential interface

(b) Response to submissions received relating to the proposed Qualifying Matter which arose from the Industrial – Residential interface review (s77K(1)(a) and s77Q(1)(a).

14. I address each of these points in my evidence below.

## SUMMARY OF REVIEW AND ANALYSIS UNDERTAKEN WITH REGARD TO THE INDUSTRIAL – RESIDENTIAL INTERFACE

15. I was engaged in January 2023 to review the potential noise issues associated with the Industrial-Residential interface, in the context of PC14. My findings and analysis were outlined in a report dated 20 January 2023 (Report number AC22386 – 02 – R3) and a memo dated 7 February 2023 (Memo number AC22386 – 03 – R2). Key elements of those reports are summarised below.

### Background

16. I understand that there has been a history of some conflict between noise generating and noise sensitive activities at this interface, and the Christchurch City Council (**CCC**) was therefore interested in whether this should be reflected in PC14 in some way.

### Current Christchurch District Plan noise rules

17. The noise limits within the Christchurch District Plan (**CDP**) are determined by the Zoning of the receiving site. The limits for noise received at the various 'Industrial' zoned sites are outlined in **Table 1 below** (i.e. noise generated on one Industrial site, and received on another).

***Table 1** – Current Christchurch District Plan noise limits for sound received at Industrial sites*

| Zone | Time (hrs) | Noise limits |
|---|---|---|
| Industrial General<br><br>Except that noise levels shall not exceed 50 dB $L_{Aeq}$/75dB $L_{AFmax}$ at any residential unit lawfully established prior to 6 March 2017 during the hours of 22:00 to 07:00 | 0700 – 2200 | 70 dB $L_{Aeq}$ |
| | 2200 – 0700 | 70 dB $L_{Aeq}$ |
| Industrial Park Zones – (Awatea and Memorial Avenue)<br><br>Except that noise levels shall not exceed 50 dB $L_{Aeq}$/75dB $L_{AFmax}$ at any residential unit lawfully established prior to 6 March 2017 during the hours of 22:00 to 07:00 | 0700 – 2200 | 60 dB $L_{Aeq}$ |
| | 2200 – 0700 | 60 dB $L_{Aeq}$ |

| | | |
|---|---|---|
| Industrial Heavy Zone<br><br>Except that noise levels shall not exceed 50 dB $L_{Aeq}$/75dB $L_{AFmax}$ at any residential unit lawfully established prior to 6 March 2017 during the hours of 22:00 to 07:00 | 0700 – 2200 | 75 dB $L_{Aeq}$ |
| | 2200 – 0700 | 75 dB $L_{Aeq}$ |

18. Noise generated in any of the Industrial zones when received at a Residential zoned property are required to comply with the Residential noise limits. These are as follows:

    0700 to 2200 hours 50 dB LAeq

    2200 to 0700 hours 40 dB LAeq / 65 dB LAFmax

19. The Christchurch District Plan requires compliance with these noise limits is measured and assessed in accordance with NZS6801:2001 Acoustics – Measurement of environmental sound, and NZS 6802:2008 Acoustics – Environmental noise – except that the provisions of NZS6802:2008 relating to Special Audible Characteristics do not apply.

20. The CDP approach for controlling industrial noise received in Residential Zones is consistent with the relevant guidance for the protection of residential areas from adverse noise effects. The Standards referred to in the CDP are current New Zealand best practice, and consistent with the National Planning Standards directions. With regard to the numerical limits themselves – for sound which contains SAC the limits are at the upper end of the range, but not inappropriate. The night time LAFmax limit is relatively stringent.

**Discussion**

21. In general terms, my review and analysis has indicated that the CDP noise limits which control the Industrial-Residential interface are in line with best practice and put the onus on Industrial operators to comply with 'residential level' limits by the time their noise reaches residential areas.

22. Many of the activities currently occurring in Industrial zones close to the Industrial-Residential interface are not high noise generating, or have arranged their sites such that compliance with the CDP noise limits is readily achieved, and it is likely that residential neighbours in these areas rarely experience any noise adverse effects.

23. A limitation on intensification close to the Industrial-Residential interface could however be beneficial when noting:

(a) There is evidence of industrial activities not complying with the noise limits. While this should be resolved via enforcement action, having less people exposed to temporary non-complying noise is desirable.

(b) Even if individual Industrial activities operate in compliance with the CDP rules, theoretically a potential 'cumulative noise' issue could exist for some specific Residential receivers. For example, in theory there is the potential for a single residential dwelling to be exposed to night time noise levels of 40 dB LAeq from a number of different Industrial operators which combine to expose them to a level of noise exceeding the WHO / NZS6802:2008 sleep protection threshold of 45 dB LAeq. This is particularly the case if some or all of the sources contain SAC (which under a full NZS6802:2008 assessment would suggest they are in effect, the receiver is experiencing a level of 45 dB LAeq already).

(c) People living across the road from Industrial zones may experience noise from on-road heavy vehicles directly associated with the Industrial zone, which is not controlled by the CDP noise limits.

(d) While the CDP noise limits are largely consistent with NZS6802:2008 and best practice, they may permit some sounds at a level and character that may still be annoying to more than an outlying percentage of the population.

(e) The upper levels of new three storey houses which would be enabled by PC14 might now overlook industrial areas, whereas before lower houses were screened. In that situation, in line with NZS6802:2008, the upper façade would now become a compliance assessment location. If noise levels exceeding the District Plan limits were received at that upper façade because it had more direct line of sight to Industrial activities, it is not clear how the situation would be resolved.

24. Based on the above findings, the CCC began considering a Qualifying Matter in the form of a buffer restricting building height in residential areas, while leaving the current acoustic controls on industrial sites as is.

25. I undertook three-dimensional modelling work, to examine various real-world and hypothetical scenarios and determine what can be concluded about the potential appropriate size for a buffer designed to prevent three storey dwellings being constructed in inappropriate arrangements at the Industrial-Residential interface.

26. The modelling results were structured into three groups, as follows:

- Situation 1 – Implications at third floor level of an industrial source which currently complies with the CDP noise limits at 1.5 metres above ground level within the Residential zone, due to screening provided by intervening structures.

- Situation 2 – Implications at third floor level of an industrial source which currently also complies with the CDP noise limits at 4.5 metres above ground level (second floor level) within the Residential zone, due to screening provided by intervening structures.

- Situation 3 – Implications at third floor level of an industrial source which currently complies with the CDP noise limits due to distance alone – i.e. it does not currently benefit from screening provided by intervening structures.

My findings for each situation were as follows.

*27. Situation 1 – An industrial source which currently complies with the CDP noise limits at 1.5 metres above ground level within the Residential zone*

The extent of the elevated noise area at the third-floor level height depends on the site layout, how much screening is currently being provided, and the distance between the source and the residential boundary. However, generally if the source is currently being fully screened at ground level by a building, the elevated noise area extends approximately 40 metres beyond the edge of the Industrial zone.

*28. Situation 2 – An industrial source which currently also complies with the CDP noise limits at 4.5 metres above ground level (second floor level) within the Residential zone*

Where there is a building between the noise source and the dwellings some shielding is still being provided to the second-floor level of dwellings – and

so the increase to third floor level does lead to an elevated noise area extending between 5 and 20 metres beyond the edge of the Industrial zone.

29. *Situation 3 – An industrial source which currently complies with the CDP noise limits due to distance alone*

A relatively common situation is where there is currently no screening between an industrial source and a residential property – for example, where mechanical equipment is located on the roof of the industrial building. As the source is already elevated, the receiver height makes little difference to the noise levels received.

**Conclusions**

30. The modelling considered numerous possible source / receiver arrangements at the Industrial-Residential interface, to examine situations where industrial noise which currently complies with the CDP limits would lead to elevated noise at the upper level of a future three level dwelling, potentially generating some direct noise effect on residential occupants or a potential noise reverse sensitivity effect for the industrial noise emitter.

31. While there are numerous circumstances under which this issue would not arise, the additional modelling and analysis demonstrated that there are realistic scenarios where the construction of three level dwellings would lead to elevated noise being experienced at the upper facade. Once real-world factors such as the screening provided by the dwellings themselves, and the probable arrangement of industrial sites is taken into account, the area within the Residential zone potentially affected is relatively modest – with:

- 40 metres potentially being a reasonable buffer distance if the situation of most concern is what might arise if neighbouring single level dwellings were replaced with three level dwellings, and
- 15 metres potentially being a reasonable buffer distance if the issue of concern is the difference between what might arise when two-storey dwellings are permitted, and what might arise if three level dwellings are permitted.

32. I understand that those wishing to construct three level dwellings in the buffer area would be required to demonstrate that the development would not unduly impact on the adjoining industrial zone as per Policy 14.2.12.1

33. The appropriate response in each case will depend on the planning situation and interpretations – particularly with regard to the status of the industrial activity. If the industrial activity in question is able to continue generating elevated noise levels at the third storey of the new dwelling, an adequate response may be for the new dwelling to incorporate enhanced sound insulation, and ensure that outdoor living areas (balconies) do not face towards the industrial source.

**RESPONSE TO SUBMISSIONS RECEIVED RELATING TO THE PROPOSED QUALIFYING MATTER WHICH AROSE FROM THE INDUSTRIAL – RESIDENTIAL INTERFACE REVIEW (S77K(1)(A) AND S77Q(1)(A))**

34. The Council received 12 submissions relating to the Industrial – Residential Interface Qualifying matter (numbered S2, S116, S175, S212, S243, S399, S689, S734, S823, S834, S853, S902). I have been asked to comment on selected submissions as outlined below. Ms Ratka has provided comment on all of the relevant submissions.

*Greg Olive (Submission 2)*

35. This submitter suggests that for their site, located at 419 Halswell Junction Road, a high level of sound insulation would be required for new dwellings due to the traffic noise insulation rules already contained in the Plan or as modified by Plan Change 5E, making the proposed Industrial – Residential interface Qualifying Matter redundant.

36. This site does have unique circumstances, including that the Industrial – Residential interface Qualifying Matter 40-metre buffer would cover very little of the site if not for the P23 Designation associated with the Southern Motorway being zoned Industrial Park (not Transport Zone), and that the most relevant Industrial Park zone site is not yet fully developed. Industrial activities are therefore currently not generating noise exceeding the District Plan limit at any location on the submitters site, and if higher noise Industrial activities were legally established on the Industrial Park site before residential development was completed on the submitters site, it is correct that the traffic noise insulation requirements would ensure third storey habitable spaces overlooking Halswell Junction Road would be sufficiently insulated. Ms Ratka has commented on the concept of potentially modifying the Qualifying Matter for individual sites.

*Ravensdown Limited (Submission 243)*

37. In their paragraph 2.45(d) (ii) and (iii), this submitter queries whether the Qualifying Matter should be amended in the case of High Density Residential Zones (**HDZ**) adjoining Industrial Heavy Zones (**IHZ**). They observe that taller dwellings are to be permitted in HDZ than in Medium Density Residential Zones (**MDZ**), and that in addition the earlier analysis may have assumed HDZ would always be separated from residential areas by an interstitial area of Industrial General Zoning (**IGZ**).

38. Noise generated within both the IHZ and the IGZ is required to comply with the same limits at the Residential interface, and the 40 m buffer was shown in the modelling to be adequate to ensure compliance at the upper level of dwellings with zero screening - it makes no difference if the 'upper level' is the third of fourth level. Differences in screening and changes with noise levels with height are reduced for greater distances between source and receiver – so the absence of an intervening IGZ zone is not of concern from that perspective. The issues the Qualifying Matter seeks to address are therefore not dependent on the proximity or otherwise of the IHZ or height of dwellings permitted in the residential area.

39. This submitter also requests a rule requiring acoustic insulation to be installed in all residential developments within the specified buffer area from industrial zones. Single and two storey dwellings are currently permitted in these areas as of right, and so I understand this request would go beyond the scope of Plan Change 14. For new potential three or four storey dwellings within the buffer area, the proposed Discretionary status allows consideration of all effects and relevant mitigation. Policy 14.2.12.1 provides pathway where 'mitigation sufficiently addresses effects' which could include acoustic insulation, where this is an appropriate response. In some situations it would not be required, and so a blanket requirement as requested by the submitter is not appropriate.

*The Catholic Diocese of Christchurch (Submission 823)*

40. This submitter questions the appropriateness of the Industrial Interface overlay applying to those sites along Lydia Street and Northcote Road, given that they will be adjoining a school and supermarket (both under development) rather than industrial activities.

41. I understand that the school designation (L226) contains noise limits of a similar form to those which apply to industrial noise received at the Residential zone interface, and supermarkets are known sources of moderate environmental noise emissions from rooftop mechanical equipment and deliveries. There is therefore the same potential issue of new three storey dwellings overlooking these activities and creating non-compliance or noise effect issues at the upper level, as many other locations along the Residential – Industrial interface. For a school the issue would be less likely, unless the site was arranged with utilities areas close to the residential boundary. If a consent was sought in due course for residential development on any surplus school land, the best approach to any direct or reverse sensitivity noise issues could be considered at the time.

*Lyttleton Port Company (Submission 853)*

42. This submission requests a built form standard applying to the Residential Hills zone equivalent to Rule 14.4.2.3.

43. The submission also notes that the Industrial interface buffer 40 metre width does not cover the entire residential property parcels between 311 – 321 Port Hills Road. The submission suggests that there might remain the potential for a three-storey building to be constructed at the south-western end of a property and the potential for reverse sensitivity effects could result.

44. I also note that my modelling indicates that at the distances from the source and source heights involved in that specific scenario, there would be very little difference in the potential reverse sensitivity situation between a currently permitted new two storey dwelling, and a three-storey dwelling constructed at the rear of the Port Hills Road properties. While the topography in this specific area may mean the dwellings are elevated compared to noise sources, the Qualifying Matter seeks to address the difference which there may be between current residential development, and new three storey dwellings. For dwellings which are situated on elevated topography in either case, the difference (and therefore the response – a 40 metre buffer) is similar. There is no technical basis from a noise point of view to align the buffer with site legal boundaries, as the modelling confirmed that the issue which the Qualifying Mater seeks to

address to address typically does not exist beyond 40 metres from the source.

**CONCLUSIONS**

45. My review has confirmed that the District Plan noise limits which control the Industrial-Residential interface are in line with best practice and put the onus on Industrial operators to comply with ‘residential level’ limits by the time their noise reaches residential areas.

46. The upper levels of new three storey houses which would be enabled by PC14 may overlook industrial areas, whereas before lower houses were screened. In that situation, the upper façade would now become a compliance assessment location. If noise levels exceeding the District Plan limits were received at that upper façade because it had more direct line of sight to Industrial activities, it is not clear how the situation would be resolved.

47. My modelling indicates that a 40-metre buffer zone is a reasonable response to address a scenario where single level dwellings neighbouring an Industrial area were replaced with three or four level dwellings. Within the buffer zone, potential taller dwellings should be reviewed on a case-by-case basis.

48. I therefore support the Qualifying Matter described in the evidence of Ms Ratka which was drafted based on my review and analysis. I have reviewed the submissions which raised technical acoustics matters in relation to the proposed Qualifying Matter, but do not recommend any changes to the Plan Change as a result.

Date: 11 August 2023

**Jeremy William Trevathan**