Before a Board of Inquiry
Transmission Gully
Notices of Requirement and Consents

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under: the Resource Management Act 1991

in the matter of: Notices of requirement for designations and resource consent applications by the NZ Transport Agency, Porirua City Council and Transpower New Zealand Limited for the Transmission Gully Proposal

between: **NZ Transport Agency**
Requiring Authority and Applicant

and: **Porirua City Council**
Local Authority and Applicant

and: **Transpower New Zealand Limited**
Applicant

Second statement of supplementary evidence of Stephen Gordon Chiles (Acoustics assessment) for the NZ Transport Agency and Porirua City Council

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Dated: 2 March 2012

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SECOND STATEMENT OF SUPPLEMENTARY EVIDENCE OF STEPHEN GORDON CHILES FOR THE NZ TRANSPORT AGENCY AND PORIRUA CITY COUNCIL

INTRODUCTION

1 My full name is Stephen Gordon Chiles.

2 I have the qualifications and experience set out at paragraphs 2 to 5 of my statement of evidence in chief, dated 15 November 2011 (*EIC*).

3 I repeat the confirmation given in my EIC that I have read, and agree to comply with, the Code of Conduct for Expert Witnesses (Consolidated Practice Note 2011).

4 In this statement of evidence I respond to the section 42A report of Nigel Lloyd, presented as evidence dated 24 February 2012. Specifically, in this evidence I address:

4.1 Assessment of noise effects using NZS 6806:2010[1];

4.2 Use of the $L_{Aeq(24h)}$ parameter for road-traffic noise; and

4.3 Criteria for road-traffic noise.

5 Consistent with my EIC, in this statement of evidence when referring collectively to the NZ Transport Agency (*the NZTA*) Project[2] and the Porirua City Council (*PCC*) Project[3] I will use the term "Transmission Gully Project" (and hereafter, *the TGP* or *the Project*).

OVERVIEW

6 Mr Lloyd's summary of district plan provisions in paragraphs 68 to 95, 101 and 102 of his evidence, essentially reaches the same conclusions as paragraphs 34 to 46 of my statement of supplementary evidence dated 9 February 2012 (*my Supplementary Evidence*). I will not discuss that matter further in this evidence.

7 The main issues Mr Lloyd raises with NZS 6806, which I will discuss in this evidence, are common with the previous 'Transit Guidelines'[4].

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1 NZS 6806:2010 Acoustics – Road-traffic noise – new and altered roads.

2 The 'NZTA Project' refers to the construction, operation and maintenance of the Main Alignment and the Kenepuru Link Road by the NZTA.

3 The 'PCC Project' refers to the construction, operation and maintenance of the Porirua Link Roads (being the Whitby Link Road and the Waitangirua Link Road) by PCC.

4 NZTA (1999) 'Appendix 6: Guidelines for the management of road traffic noise – state highway improvements' in Planning policy manual.

As I discuss in my Supplementary Evidence, the Transit Guidelines were widely accepted by acoustic specialists and were in use for State highway projects for over a decade prior to adoption of NZS 6806. Therefore, while NZS 6806 is a relatively recent standard, the main concerns raised existed prior to the publication of that particular standard.

8 Mr Lloyd notes in paragraph 73 of his evidence that in his opinion the Transit Guidelines had significant shortcomings. While I have set out in paragraph 14 of my Supplementary Evidence challenges I have seen in the application of the Transit Guidelines, I consider they were not fundamentally flawed in the manner implied by Mr Lloyd.

9 I have used NZS 6806 as a tool in my assessment. Whilst the Board and Mr Lloyd have expressed some concerns with this standard, I would have expected greater concerns from submitters had I ignored it. I have recognised the scope and purpose of NZS 6806 and I am aware of issues within it that are subject to debate. I have addressed these through my broader assessment of potential noise effects.

10 None of the issues raised by Mr Lloyd in his evidence lead me to alter the conclusions of my assessment, including the mitigation I recommend.

ASSESSMENT OF NOISE EFFECTS

11 Mr Lloyd raises concerns in paragraphs 14 and 15 of his evidence that an assessment using NZS 6806 might not provide a full assessment of actual or potential effects. While NZS 6806 is clearly written for application under the Resource Management Act (*RMA)*, the aim of NZS 6806 is not to provide an instruction manual for preparing an assessment of noise effects. Rather, NZS 6806 provides standardised measurement, prediction and assessment procedures that can inform an assessment.

12 I agree with Mr Lloyd that an assessment of noise effects for a Notice of Requirement must also include broader considerations to address the requirements of the RMA.

13 Mr Lloyd sets out in paragraph 16 of his evidence what he would expect a full assessment of noise effects to include. I confirm that all of the issues Mr Lloyd lists as being normally covered are included in the Assessment of Environmental Effects (*AEE)* for the Project, and in Technical Report 12 (*TR12)* which forms part of that AEE. Specifically:

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http://www.nzta.govt.nz/resources/planning-policy-manual/docs/planning-policy-manual-noise-guidelines-1999.pdf

13.1 The existing sound environment has been measured and modelled as detailed in Section 3 of TR12;

13.2 Appropriate noise criteria are set out in Section 2 of TR12;

13.3 Predicted noise levels without any mitigation are shown on drawings numbered NB01 to NB21;

13.4 Noise mitigation required to meet the criteria in Section 2 is set out in Section 5 of TR12;

13.5 Future noise levels, where these differ from unmitigated levels, are shown on drawings numbered NC10, NC15, NC20 and NC21; and

13.6 Rather than monitoring, conditions controlling noise are discussed in Section 7 of TR12.

14 Before I conducted my assessment I prepared a detailed scope of works fully setting out the methodology and criteria I proposed to adopt. This was independently reviewed separately by acoustics experts Nevil Hegley for the NZTA (as a peer review), and Malcolm Hunt for the RATAG[5]. Both these specialists have also reviewed TR12, along with Bill Wood, the acoustics expert working for submitters in Rangatira Road. As well as Malcolm Hunt, Vince Dravitzki (again an acoustics expert) attended the noise mitigation workshop to observe the process and provided comments. All four of these acoustics experts, all with significant past and recent experience in road-traffic noise assessment, considered my assessment methodology appropriate under the Resource Management Act. Had any issues been raised by any of these other experts then I would have reviewed my assessment methodology as appropriate.

15 Mr Lloyd makes a number of comments about the principle and purpose of NZS 6806 including in paragraph 19 of his evidence that it "*works from the principle that the benefits of the proposed road will outweigh any negative noise impacts…*". Again, the stated outcome of NZS 6806 is to assist the process by providing measurement, prediction and assessment methods. It does not purport to provide guidance as to where roads should be built. As stated at paragraph 1.1.4 and C6.1.1.of the Standard, the noise criteria included in the Standard were developed with the view to setting "*reasonable criteria for the road-traffic noise from new or altered roads taking into account health issues associated with noise, the effects of relative changes in noise level on people and*

[5] Regulatory Authority Technical Advisory Group. Mr Hunt also carried out a "completeness check" of TR12 for the EPA.

communities and the potential benefits of new and altered roads to people and communities".

16 In paragraphs 19 and 20 of his evidence Mr Lloyd discusses issues related to the selection of the route for a new road. However, he does not clearly differentiate the processes between the avoidance and reduction of effects through route selection and the detailed design of mitigation such as barriers. These processes for linear infrastructure are different to noise assessment for noise sources on discrete sites such as industry, ports and airports. The nature of linear infrastructure demands a multi-stage approach for assessment. Due to the long time over which these processes have occurred for the TGP, some aspects of the previous assessment might not be immediately apparent. As I was not involved with the Project prior to 2009, I do not have first-hand knowledge of the earlier assessment stages.

17 Of relevance to some of the issues Mr Lloyd raises, is that during the investigation of proposed linear infrastructure there are generally several alignments assessed. For example, last year I considered potential noise effects from possible alternative alignments for the proposed Peka Peka to Otaki Project. During such processes, the potential noise effects of any proposed alignment are considered and the acoustics engineer will normally identify the relative merits of different alignments in terms of potential noise effects. This is taken into consideration along with all other relevant factors when determining a preferred alignment.

18 For the TGP during the previous designation process, four alignment options were investigated at the southern end of the route, and the Takapu Valley option was rejected, due to effects on residents there. I understand from Mr Dravitzki, who conducted the noise assessment for the Phase I investigations for the TGP completed in 2008, that noise was one of the detailed criteria within the multi-criteria analysis used to determine the 'preferred alignment'.

19 As well as determining the overall alignment, a similar process is followed for optimising the alignment in localised areas, both vertically and horizontally. For example, in Section 5.1 of TR12 I detail two areas where potential noise effects were one of the factors that influenced the alignment.

20 Thus for linear infrastructure, prior to considering issues such as noise barriers in detail, there should already have been comprehensive consideration of alignment options that should avoid or reduce potential effects. That was the case for this Project. Avoidable alignment options with 'fatal flaws' where it is clear substantial noise effects cannot be adequately mitigated should have been discounted (unless other options such as property purchase are being pursued).

21 For a given alignment, Mr Lloyd[6] and I both appear to be in agreement that NZS 6806 does provide the most appropriate mechanism for determining the best practicable option for controlling road-traffic noise.

22 In using NZS 6806 the Project team has evaluated options to determine the best practicable option. Details of the factors considered and reasons for the selected options, as well as descriptions of residual noise effects, are reported in TR12 and discussed in my evidence. This information enables the Board to consider the issues, and decide on alternative mitigation if appropriate, albeit contrary to my recommendations. In my opinion the selected mitigation is appropriate, but regardless, the information provided allows others to consider the issues.

ACOUSTICS PARAMETERS

23 I agree with Mr Lloyd that there would be merit in adopting the L_{den} parameter for assessing road-traffic noise. I see more merit in the use of separate day and night parameters, as suggested as an alternative by Mr Lloyd in paragraph 47 of his evidence, because it avoids confusing physical measures with adjustments for subjective response. However, for the reasons I will now discuss I consider that use of any of these parameters would not have made any difference to the outcome of my assessment.

24 The L_{den}, L_{dn}, $L_{Aeq(24h)}$, $L_{Aeq(9h)}$, $L_{Aeq(15h)}$ and other parameters such as L_{night}, are all based on the same notion of assessing noise effects based on the 'energy average' level over a given time period. They do not represent the short-term peaks of noise but rather represent the overall noise exposure. Mr Lloyd[7] and I are in agreement that this is the most appropriate approach for road-traffic noise. I consider that of these parameters each has pros and cons, and none of them resolve all potential issues.

25 I discussed acoustics parameters in paragraphs 19 to 21 of my Supplementary Evidence, and will not repeat those details. However, I draw attention to paragraph 21, where I note that the key factor is for the criteria to be consistent with the acoustics parameter chosen, which is the case with the $L_{Aeq(24h)}$ parameter in NZS 6806.

26 NZTA research report 446[8] published in 2011, examines changes in traffic flow on state highways between weekdays, weekends and

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6 Lloyd, 24 February 2012, para 14.

7 Lloyd, 24 February 2012, para 23.

8 Dravitzki, Jackett and Wood, The variability of road traffic noise and implications for compliance with noise conditions of roading designations, November 2011, NZTA research report 446.

during holidays. Locations examined included State Highway 1 at Ngauranga overpass and Pukerua Bay. It was found that actual changes in traffic composition such as changes in proportions of heavy vehicles would make less than 1 dB difference to noise levels. This research did not consider diurnal variations, but I would expect similar changes to those observed between days. The relevance of this research is that it shows state highway road-traffic noise levels do not significantly change with actual measured changes in traffic composition.

27 In paragraph 44 of Mr Lloyd's evidence he discusses abnormal diurnal variations in road-traffic. I agree that it is possible to devise a hypothetical abnormality, such as a very high proportion of heavy vehicles at night, that would be reflected to a greater extent in the L_{den} parameter than the $L_{Aeq(24h)}$ parameter. However, with either parameter, given the predicted traffic flow of over 20,000 vehicles per day, any abnormalities would have to be substantial before causing a significant change. I cannot envisage a realistic scenario that would give rise to such effects, unless influenced by a radical change brought about by government policy at a national level for example.

28 Given the actual stability of state highway traffic, in practical terms there will be little discrimination between the L_{den} and $L_{Aeq(24h)}$ parameters, or other alternatives. I consider that NZS 6806 could function effectively using either parameter, although the criteria would need to be adjusted if using L_{den}.

29 In 2006 I chaired a session of the first joint conference of the Australian and New Zealand Acoustical Societies about road-traffic noise. Part of that session was a debate on whether any future New Zealand Standard for road-traffic noise should maintain $L_{Aeq(24h)}$ or should switch to L_{dn} or an alternative parameter. Prior to general discussion, two panel members set out the advantages of $L_{Aeq(24h)}$ and L_{dn} respectively. The majority of people at that meeting favoured the retention of $L_{Aeq(24h)}$.

30 Mr Lloyd notes in paragraph 74 of his evidence the difficulties involved and long timeframe that it took to produce NZS 6806. The choice of the appropriate parameter is just one of the difficulties. In my opinion, given all the other changes brought about by NZS 6806, retaining the $L_{Aeq(24h)}$ parameter has eased the introduction and acceptance of the standard. I understand that when the draft NZS 6806 was available for public comment there were no submissions objecting to the use of $L_{Aeq(24h)}$, or proposing an alternative.

31 In paragraph 24 of his evidence Mr Lloyd references Land Transport New Zealand Research Report 299 as pointing towards alternative parameters such as L_{dn}. This report was published in 2006 prior to

the development of NZS 6806. I note that Mr Hunt was one of the principle authors of that report and was also on the NZS 6806 committee, so would have been fully aware of the relative merits of the parameters as set out in that research report. Mr Hunt did not raise these issues when reviewing my work on behalf of RATAG.

32 I consider a refinement that could be made in a future revision of NZS 6806 would be to change from $L_{Aeq(24h)}$ to an alternative acoustics parameter or parameters. However, $L_{Aeq(24h)}$ has been in use in New Zealand for over a decade and currently provides a consistent standardised parameter, which while not theoretically perfect, works in practice for actual state highway traffic patterns.

NOISE CRITERIA

33 Mr Lloyd discusses noise criteria at length both in general terms and with respect to the Waterview Decision. Mr Lloyd makes reference in paragraphs 35 and 36 of his evidence to World Health Organisation (*WHO*) recommendations relating to noise levels which generally correspond to the onset of health effects. I agree that such criteria are desirable, although strict use of such idealistic criteria or those from subsequent WHO publications would result in projects such as the TGP only being possible with full enclosure/tunnelling for much of the alignment.

34 Existing road-traffic noise exposure is significantly higher than optimal levels throughout New Zealand and other countries. Even beside a suburban street the optimal levels in the WHO recommendations would often be exceeded. Road-traffic noise criteria in most countries including Australia and New Zealand are set above the WHO levels. The full context of the WHO report, in particular Section 5, recognises this situation. Clause 4.7.2 of NZS 6806 sets out the basis on which its noise criteria are based:

> *The noise criteria in this Standard have been selected to limit adverse effects on people of road-traffic noise above a reasonable level and health criteria, recognising as does the WHO that the evaluation of control options must take into account technical, financial, social, health, and environmental factors…*

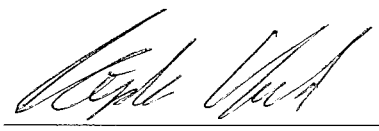
35 Throughout New Zealand my experience is that people generally accept road-traffic noise levels within the criteria set in NZS 6806, and these do not cause undue disturbance to normal domestic activities. I acknowledge that at road-traffic noise levels at the upper end of the NZS 6806 criteria, people will generally adapt their use of indoor and outdoor spaces. While the criteria do not represent the optimal outcome from a purely acoustics point of view, I consider that they do represent a reasonable and acceptable

outcome. The NZS 6806 criteria are consistent with criteria used in other countries such as Australia.

36 Mr Lloyd discusses the internal 'Category C' criteria in NZS 6806. This was a new safety net introduced by NZS 6806 that was not present in the Transit Guidelines. Under those Guidelines external noise levels could be maintained above 70 dB and there was no protection of the indoor environment. I consider that NZS 6806 correctly maintains the focus on outdoor criteria as they protect both indoor and outdoor environments. However, I agree with the approach of adding the Category C safety net for the highest external noise environments, and that is what I have done in my assessment.

37 I agree with Mr Lloyd in paragraph 55 of his evidence that the extent to which the outdoor criteria will control the indoor criteria will depend primarily on the location and use of ventilating windows for an individual building. In my experience, most houses adjacent to state highways adapt their ventilation to avoid ventilating windows to sensitive spaces facing a state highway. Therefore, in practice most houses in Categories A and B will be in compliance with the internal noise criteria. At the internal criteria there is not a step change in response to noise, and therefore I consider that there would not be significant adverse effects resulting from any marginal exceedances.

38 In paragraph 60 of his evidence Mr Lloyd discusses the NZTA Reverse Sensitivity Policy. That Policy was developed by the NZTA and published in 2007, completely separate and prior to NZS 6806 which was later developed by Standards New Zealand and published in 2010. I agree with Mr Lloyd that the internal noise criteria in that Policy should be consistent with NZS 6806. I understand from the NZTA that there is already a work programme in place to review that issue. However, I am currently advising the Department of Building and Housing on proposed changes to Clause G6 of the New Zealand Building Code, which may be extended to include requirements for insulation of houses from environmental sound. That requirement would introduce internal criteria in a slightly different format, and might make the NZTA Reverse Sensitivity Policy partly redundant anyway. I note that I do not consider that the external noise criteria in the Reverse Sensitivity Policy should be consistent with NZS 6806, as when building new houses there is usually greater opportunity to aim for better amenity such as through subdivision layout.



Stephen Gordon Chiles
2 March 2012