

Report pursuant to s 42A Resource Management Act 1991

In the matter of:

A Notice of Requirement to construct, operate, use, maintain and improve approximately 11.5km of new State Highway connection between Ashhurst and Woodville

And:

A hearing by Manawatu District Council, Palmerston North City Council and Tararua District Council pursuant to s 102

Requiring Authority:

New Zealand Transport Agency

Hearing date:

Monday 25th March 2019

Section 42A Technical Evidence: Noise

By: Nigel Lloyd

NJ-015652-992-513-V1:KZ-e



Executive Summary

1. I have been asked to assess the noise and vibration elements of the Notice of Requirement and in particular, Technical Assessment #2, which was prepared by Dr Stephen Chiles.
2. I undertook conferencing on operational and construction noise and vibration with Dr Chiles on 13 February 2019. The resulting Joint Witness Statement (“JWS”) is included at **Appendix A**.
3. The key issues discussed in the JWS have arisen as part of my review and were provided to Dr Chiles as a ‘Will Say’ statement. My review takes into account the matters raised in submissions, which I specifically comment on.
4. Technical Assessment #2 provides an appropriate assessment of adverse operational noise subject to:
 - a) The requirement for a more indepth and ongoing assessment for dwellings close to the roundabouts situated at either end of the Project. The categorisation of the noise sensitive activities (“PPFs”) in terms of NZS 6806 near the roundabouts is complicated by a variety of factors. Noise mitigation needs to be based on applying the best practicable option, rather than a categorisation in terms of NZS 6806. This includes the judicious use of landscaping, and behavioural controls for drivers, thus avoiding the need for abrupt braking and acceleration;
 - b) Recognition that supplementary braking systems on some heavy vehicles generate a loud and distictive noise which will occur on the lower eastern slope due to the long steep gradient. If this noise causes sleep disturbance then consideration could be given to acoustic treatment and ventilation of bedrooms;
 - c) A post construction review should be undertaken in accordance with NZTA P40:2014;
 - d) Sound level measurements should also be made at critical locations (as defined in my evidence) to verify noise modelling;

- e) A ring road around Woodville has the potential to significantly reduce noise through parts of the town at least; and
- f) Otherwise, the noise mitigation options for Vogel Street are limited, with low noise asphalt road surface representing the best practicable option.

5. I have considered the draft designation conditions and make recommendations on:

- a) The need for the Territorial Authorities to approve or certify the various frameworks/plans which are necessary as part of the noise mitigation design process identified in Technical Assessment #2. I consider this to be necessary because of the complexity associated with applying strict noise criteria and/or formulating specifications for the works at the early stage of the design process;
- b) The wording of condition 19 for construction noise;
- c) The wording of condition 21 for construction vibration;
- d) The wording of condition 22 for the construction noise management plan including avoiding night-time construction traffic passing through Ashhurst and Woodville and not using Hope Road for construction heavy vehicles; and
- e) The additional requirements for condition 29, identifying engine braking noise as a particular issue.

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1 Introduction

1. My name is Nigel Robert Lloyd. I hold a degree in Mechanical Engineering from the University of Wales, University College Cardiff in 1976. I am a Member of the Acoustical Society of New Zealand and the Association of Australasian Acoustical Consultants. I have completed a 'Making Good Decisions' course.
2. I am an acoustical consultant with 42 years of experience in noise control and acoustical consultancy.
3. I have prepared this evidence on behalf of the Territorial Authorities Palmerston North City Council, Manawatu District Council and Tararua District Council (the "**Territorial Authorities**") in relation to the Notice of Requirement ("**NOR**") for Te Ahu a Turanga – Manawatu Tararua Highway Project ("**the Project**") lodged by the New Zealand Transport Agency ("**NZTA**"). I understand that my evidence will accompany the Planning Assessment being prepared by the Territorial Authorities under s 42A of the Resource Management Act 1991 (the "**RMA**").
4. I have advised both Palmerston North City Council and Manawatu District Council on their District Plan noise reviews.
5. I have undertaken peer reviews for the following roading proposals:
 - a) SH 1 Hamilton City Bypass – 2004;
 - b) SH 50A Hawkes Bay Expressway – 2006;
 - c) Hastings Northern Arterial – 2008;
 - d) Transmission Gully – 2012;
 - e) Christchurch Southern Motorway Stage II – 2016;
 - f) SH 3 Mt Messenger - 2018.

2 Expert Witnesses – Code Of Conduct

6. I confirm that I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014 and that I agree to comply with it. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions that I express and that, except where I state I am relying on information provided by another party, the content of this evidence is within my area of expertise.

3 Background and Scope of Evidence

3.1 Background

7. The Project is defined as the construction, operation, use, maintenance and improvement of approximately 11.5km of new State Highway connection between Ashhurst and Woodville under the RMA. The proposed new section of State Highway will replace the current State Highway 3 route through the Manawatu Gorge, which has been closed indefinitely. A detailed description of the Project is set out in Part C of the Assessment of Environmental Effects (“AEE”) submitted by NZTA and a summary description in the s 42A Planning Assessment.

3.2 Scope of Evidence

8. I have been asked to assess the noise and vibration elements of the NOR. My assessment considers the following matters:
- a) Key issues in contention;
 - b) The statutory context;
 - c) An overview of the existing sound environment;
 - d) Adequacy of NZTA’s investigations and interpretation of the findings of those investigations;
 - e) The likely key effects (positive and adverse) on the environment of allowing the Project;
 - f) The appropriateness of any proposed mitigation measures or monitoring;

- g) The submissions relating to noise; and
- h) Any other matters that I consider relevant to the Project.

9. My evidence should be read in conjunction with the evidence of the other experts that have contributed to the s 42A Planning Assessment.

3.3 Reports and Material Considered

10. As part of preparing my evidence, I have read the following reports and documents:
- a) Te Ahu a Turanga: Manawatu, Tararua Highway Project, Notices of Requirement for Designations, Volume 2: Assessment of Effects on the Environment and Supporting Material (the noise and vibration section is Part G section 28);
 - b) Te Ahu A Turanga: Manawatu Tararua Highway Project, Technical Assessment #1 Traffic by David Dunlop;
 - c) Te Ahu A Turanga: Manawatu Tararua Highway Project, Technical Assessment #2 Noise And Vibration by Dr Stephen Chiles; and
 - d) Te Ahu a Turanga: Manawatu Tararua Highway Project, Response to feedback from Territorial Authority Reporting Team on draft notice of requirement documents.

3.4 Expert Conferencing

11. I undertook expert conferencing on noise and vibration with Dr Chiles on 13 February 2019 and the resulting JWS is included at **Appendix A**. I refer to matters that were discussed and agreed in the JWS throughout this evidence.

3.5 Site Visit

12. I undertook site visits on 23 November 2018 and 29 January 2019 with the s 42A Reporting Team and NZTA representatives and I am familiar with the surrounding environment.

3.6 Statutory Context

13. The relevant statutory documents and provisions relevant to the evaluation of the NOR have been set out in the s 42A Planning Assessment. For the purposes of preparing this evidence, I have had particular regard to the following statutory provisions and direction that are relevant to the topic area I address.
14. The relevant District Plans provide different controls on State Highway noise. Both the Manawatu District Council and Palmerston North City Council District Plans include provisions for setback and noise insulation requirements for new dwellings in the Rural Zones. Tararua District Council has no such controls in its District Plan.
15. Objective 2 (Section 9) of the Palmerston North District Plan for Rural Areas encourages the effective and efficient use and development of the natural and physical resources of the rural area. Policy 2.2 includes the control of the actual or potential adverse environmental effects. Policy 2.3 includes the control of noise in the rural area.
16. Objective 3 (Section 9) of the Palmerston North District Plan is to maintain or enhance the quality and natural character of the rural environment. Policy 3.1 provides for the health and safety of rural dwellers by establishing specific noise limits for the rural area.
17. Objective 2 (Chapter 3B) of the Manawatu District Plan is to protect the existing roading network from the potential adverse effects of all land use activities, although Policy 2.3 is to restrict the through-movement of traffic where this can have adverse effects, including for noise. Objective 3 is to mitigate the adverse effects of roads and vehicles on the amenity values of the District however noise is not specifically mentioned in the policies under Objective 3.
18. Objective 2.8.3 in the Tararua District Plan is to ensure the safe, efficient and effective operation of the district's transportation networks while avoiding, remedying or mitigating adverse environmental effects. Policy 2.8.3.2(h) is to avoid, remedy or mitigate the adverse effects of transportation activities on the environment.

19. Both the Manawatu and Palmerston North City District Plans reference NZS 6806:2010 *Acoustics – Road-traffic noise – New and altered roads*. The Tararua District Plan makes no reference to this Standard.
20. All three Territorial Authorities refer to NZS 6803:1999 with respect to construction noise.

4 Existing Environment

21. The existing environment is described on pages 11 - 14 of Technical Assessment #2. I consider that Dr Chiles (with assistance from others) has appropriately described the existing environment with reliance primarily placed on acoustic modelling of existing road traffic noise and a separate assessment where there is not currently any predominant road traffic noise.
22. The acoustical modelling is included at Appendix 2.B of Technical Assessment #2 and is supplemented by environmental sound monitoring which I discuss further below.
23. My understanding is that the existing sound environment is that which is currently experienced by the community as opposed to the situation that would have occurred prior to the closure of the Manawatu Gorge. This position is agreed in the JWS.
24. The existing environment can be summarised in various locations throughout the proposed NOR as:
 - a) Ashhurst – Traffic noise causing significant adverse community reaction;
 - b) Ashhurst (Napier Road) – Road traffic noise reduced as a result of the closure of the Manawatu Gorge but remains part of the character of the environment;
 - c) Bridge to Bridge – Modest traffic flows but one house likely to be disturbed by current traffic noise (close to the intersection of SH3 and SH57);
 - d) New Manawatu Bridge – Relatively quiet, sporadic visitor sounds and distant road traffic audible. Occasional rail noise;
 - e) Western Slope - Relatively quiet natural sounds with sporadic visitor sounds and distant road traffic possibly audible. Occasional rail noise;

- f) Te Apiti Wind Farm and Ridge – Exposed land with natural sounds, wind farm sounds (which would be specifically wind turbine noise) and sporadic farming activity, including farm animals;
- g) Eastern Slope – Farm land with occasional road traffic but dominated by natural sounds; and
- h) Woodville Gateway – Urban sounds with significant existing road traffic noise.

5 Data Collection and Assessment Techniques

- 25. Technical Assessment #2 considers that the majority of the Project should be considered as a ‘new road’ under NZS 6806 and the roundabouts at either end of the Project should be considered to be ‘altered roads’. Existing routes beyond the roundabouts should also be considered as ‘altered roads’.
- 26. The definition of ‘altered road’ in NZS 6806, section 1.5 means an existing road that is subject to alterations of the horizontal or vertical alignment where the alterations incrementally increase the existing road traffic noise levels by specified degrees, i.e:
 - a) ≥ 64 dB LAeq(24hr) by more than 3dB; or
 - b) ≥ 68 dB LAeq(24hr) by more than 1dB.
- 27. A new road (NZS 6806, section 1.6) is any road which is to be constructed where no previously formed legal road exists. A new road excludes any existing road and any altered road but includes the formation of any previously unformed legal roads.
- 28. NZS 6806 only applies to new or existing roads and has different noise criteria (NZS 6806 – Table 2) for altered roads and for new roads (with a volume of 2,000 to 75,000 annual average daily traffic (“AADT”) at the design year).
- 29. I agree that the Project should be treated as a new road but it is unclear from Technical Assessment #2 why the roundabouts at either end should not also be considered as new roads. While there are existing roads situated near both of the proposed roundabouts, significant changes are required to the immediate roading system in both cases. This may have particular relevance to the dwelling at 1213 Fitzherbert East Road (on the corner of SH3 and SH57), the owner of which is a

submitter (S366) and who seeks for the route to be moved away from his dwelling (see paragraph 72 below). Dr Chiles expresses his doubts over the durability of an existing earth bund beside the property (Technical Assessment #2, section 138) and recommends, subject to landowner approval, that an alternative bund be constructed within the designation (for which there is space). The acoustics modelling undertaken in Technical Assessment #2 relies on this alternative bund.

30. Given the complication of the circumstances of the routes as they impact on dwellings situated close to the roundabouts, I agree with Dr Chiles that the standard categorisations of NZS 6806 (and thus the noise criteria) are not appropriate for those dwellings (see JWS at **Appendix A**). Development of noise mitigation measures/techniques near to the roundabouts should be focused on achieving the best practicable option to manage sound characteristics associated with vehicles braking and accelerating.
31. NZTA has a recommended guideline for operational vibration which is based on Norwegian Standard NS 8176.¹ The Norwegian Standard indicates that approximately 6% of people would be highly annoyed with 0.3mm/s peak particle velocity (“PPV”). The remaining majority (approximately 94%) of the general population may perceive the vibration and not experience levels of discomfort.
32. Dr Chiles states (Technical Assessment #2, paragraph 75) that previous measurements of vibration have demonstrated that the 0.3 mm/s $v_{w,95}$ criterion is readily achieved near to a well-constructed State Highway. Complying with this criterion is, to a major extent, dependent on the level of maintenance provided to the road surface. The formation of inconsistencies (such as pot holes) will generate higher levels of vibration. This is within NZTA’s control. The secondary consideration is the propagation of the vibration which depends on the geomorphology of the surrounding land e.g. whether the land has weak or soft soils.

¹ Norwegian Standard NS 8176E:2005 Vibration and shock – Measurement of vibration in buildings from land based transport and guidance to evaluation of its effects on human beings.

33. I accept that the operational vibration criteria recommended by Dr Chiles in Table 2.3 of Technical Assessment #2 (particularly Category A) is appropriate for adoption as part of the conditions of the NOR and that the State Highway can be designed and maintained to ensure compliance with these standards. However, I do comment on how these criteria should be applied in the draft conditions (see paragraph 100 below).
34. All the applicable District Plans use and provide for NZS 6803:1999² in relation to construction noise and vibration. It is recommended NZS 6803:1999 is adopted.
35. NZS 6803:1999 defines 'long-term' construction work as construction work at any one location with a duration exceeding 20 weeks. Dr Chiles recommends that the 'long-term' noise criteria is adopted, which I consider appropriate.
36. Dr Chiles and I agree in the JWS that "(15 min)" should be removed from the column heading in condition 19. The reason is that NZS 6803:1999 (at section 6.3) does not set a 15 minute averaging time. It recommends that care be taken to ensure the measurements are representative of the sounds under investigation. It states that the measurement sample time should not exceed one hour, noting that 15 minutes will often be adequate.

6 Project Effects

37. The Technical Assessment #2 considers the potential noise impacts in three categories:
 - a) Operational road traffic noise;
 - b) Operational road traffic vibration; and
 - c) Construction noise and vibration.
38. The potential noise impacts are then assessed under the eight Project sectors (see paragraph 24 above).

² NZS 6803:1999 Acoustics - Construction noise

6.1 Operational Noise Effects

39. Dr Chiles identifies the positive effects (see Technical Assessment #2 paragraphs 99 and 101) of the Project, which will result in a substantial reduction in traffic volumes through Ashhurst and for back roads around Woodville.
40. The operational noise effects for the Project with no noise mitigation are summarised in Table 21 of the AEE³. A summary of which is included in Table 1, below:

Table 1. Summary of Operational Noise Effects from AEE

LOCALITY	SUMMARY OF EFFECTS – WITH NO MITIGATION
Ashhurst	When compared to the ‘do-nothing’ scenario, the Project results in a substantial reduction in traffic through Ashhurst and as a result road-traffic noise is reduced by approximately 7 dB at approximately 250 houses in Ashhurst. The Project results in most of these houses having a noise exposure of less than 57 dB $L_{Aeq(24h)}$, which is the most stringent criterion in NZS 6806 and a significant positive effect (although it is noted that this may be perceived as returning to the situation prior to the Manawatu Gorge closure in 2016).
Ashhurst (Napier Road)	As a result of the Project, 16 PPFs on State Highway 3 between Cambridge Avenue and the Manawatu River move from noise levels mainly below NZS 6806 Category A to Category B (and in one case Category C). The noise level increase is modest at 4dB, but results in noise exposures that are high and is a significant adverse effect.
Bridge to Bridge	Three PPFs will receive road-traffic noise levels within NZS 6806 Category A as a result of the Project*. Because these PPFs already experience road-traffic noise in the environment the noise effect is generally minor. It is noted that sound characteristics from vehicles traversing the roundabout could cause significant disturbance (due to vehicles braking and accelerating) at nearby PPFs if there are no controls to moderate driver behaviour.
New Manawatu River Bridge	Road-traffic noise is likely to be the most noticeable sound in the aural environment. In the context of an area that is dependent on vehicle access, and has historically been adjacent to a State highway, the adverse effect of road-traffic noise in this area is considered minor.
Western slope and Te Apiti Wind Farm and ridge	There are no PPFs near the western slope or upper eastern slope. However, sound from trucks engine braking will be

³ Te Ahu a Turanga; Manawatu, Tararua Highway Project, Notices of Requirement for Designations, Volume 2: Assessment of Effects on the Environment and Supporting Material, 31 October 2018

LOCALITY	SUMMARY OF EFFECTS – WITH NO MITIGATION
	audible over a wide area, albeit at modest levels. This sound will be similar to trucks engine braking on the existing Saddle Road. As such, while there will be some variation in where the sound is heard, the noise effect will be minor.
Eastern slope	There are two PPFs near the lower eastern slope that are both predicted to receive road-traffic noise within NZS 6806 Category A and, as such, adverse effects will be minor. However, as compared to the current rural environment, the effect of engine braking noise at these PPFs may be significant.
Woodville gateway	There are numerous PPFs in the vicinity of the roundabout. The noise levels at most of these PPFs are predicted to be in NZS 6806 Category A and therefore any adverse noise effects will be minor, particularly because the PPFs are already affected by road-traffic noise. As for the western roundabout, sound characteristics from vehicles traversing the roundabout could cause significant disturbance at nearby PPFs if there are no controls to moderate driver behaviour.
Woodville outskirts	At the eastern extent of the NOR corridor, the Project will result in a substantial reduction in traffic volumes on Woodlands, Oxford and Pinfold Roads. Compared to the scenario without the Project in 2041, road-traffic noise is reduced by 10 dB or more at approximately 25 houses on the outskirts of Woodville and is a significant positive effect (again, it is noted that this may be perceived as returning to the pre-existing situation).
Woodville	The Project results in a substantial increase in future traffic volumes using Vogel Street through Woodville (with traffic diverting from Oxford and Pinfold Roads onto State Highway 3). Without the Project 39 PPFs in Woodville are predicted to be in Categories B or C. This number increases to 50 PPFs with the Project. While the Project is only a contributing factor to existing high noise exposures, it worsens an unsatisfactory situation and is a significant adverse effect.

* The acoustics modelling for the PPF adjacent to the SH3 and SH57 intersection includes noise screening by an existing earth bund beside the property.

41. I note that the above summary in Table 1 is copied from the AEE and that the assessment in the JWS modifies the findings, particularly in respect of:

- a) The categorisation of PPFs near to roundabouts under NSZ 6806; and
- b) The impact on the two dwellings nearest to the eastern slope, which would be subject to engine braking noise from heaving trucks. The impact of which may be significant (as recognised in Table 1, above).

42. Noise is only assessed for PPFs defined by NZS6806. Thus, no assessment is made of any land where dwellings could be built in the future but where no building consent has been obtained. No assessment has been made of the effects on the Department of Conservation (“DOC”) scenic reserve, which the route passes through on the western slope. These matters are raised in submissions (S369 DOC) and are discussed in section 8 “Review of Submissions”.
43. No assessment is made of the AgResearch land (S312).

6.2 Operational Vibration Effects

44. There are no dwellings close enough to the new road or altered roads such that operational vibration is an issue. To achieve this NZTA must properly maintain the surface of the roads.

6.3 Construction Noise and Vibration Effects

45. Technical Assessment #2 identifies two areas where works in the proposed designation may be within 50 metres of dwellings:
- a) The intersection between SH3 and SH57; and
 - b) Woodville gateway.
46. Dr Chiles’ assessment is that the new road is sufficiently distant to dwellings. A separation of 200 metres or more will ensure that construction noise can comply with the daytime limits recommended by NZS 6803.
47. The approach taken in Technical Assessment #2 is that the dwellings close to existing roads at either end of the route (including those close to the roundabouts) will already experience construction noise from the maintenance of those roads from time to time. Thus, some construction noise should already be expected. While this noise may exceed the limits in NZS 6803, the view in Technical Assessment #2 is that the noise can be appropriately managed. I concur with Dr Chiles on this and we have agreed that alternative mitigation strategies should be provided for in the Construction Noise and Vibration Management Plan (“CNVMP”) where this situation eventuates. Such strategies could include consultation with affected parties and consideration of any

site-specific options as they arise. These are generally set out in Annex E of NZS 6803:1999. I discuss this further in paragraph 100, below.

48. A similar approach is taken with construction traffic. Construction traffic is likely to exacerbate existing operational road-traffic noise as it passes through Ashhurst and there could be in the order of 100 heavy construction vehicles a day passing through (see Technical Assessment #2, at paragraph 125).
49. Dr Chiles identifies that high volumes of heavy construction trucks at night will create a potentially significant effect. Dr Chiles and I agree that conditions on the NOR should require that construction traffic be avoided through Ashhurst and Woodville at night; excluding essential movements such as continuous concrete pours and over-dimension loads.
50. Dr Chiles does not consider that construction traffic will be an issue on the eastern side of the Project. Part C (10.4) of the AEE identifies that it is likely that Hope Road will need to be upgraded to cater for construction traffic. However, Dr Chiles and I have agreed that Hope Road should not be used as an access for bulk haulage or regular heavy construction vehicles. Otherwise the implications are that high levels of construction traffic noise will be generated for the neighbours of that section of Hope Road (Nos 29 and 75). Residual sound monitoring at 75 Hope Road undertaken by Michael Smith as part of the NZTA assessment (Technical Assessment #2 Appendix 2.C) measured an ambient sound level of 50 dBA $L_{Aeq(24h)}$ although the background sound level (L_{A90}) was not reported. The night-time background sound levels at 75 Hope Road are in the order of 30 dB L_{A90} . The use of Hope Road by construction traffic has the potential to have a significant impact on the occupants of these dwellings.

7 Noise Mitigation

51. Dr Chiles identifies that engine braking noise generated by trucks descending the lower eastern slope will have significant adverse effects on, at the least, the two closest dwellings which are on either side of the alignment. The issue here is that the location is at the end of a long steep downhill gradient where the use of engine brakes will be unavoidable.

52. The two dwellings identified (49807 SH3 and 75 Hope Road) will be separated from the alignment by at least 200 metres, but the engine braking noise will still be clearly audible and potentially disturbing for residents.
53. The engine braking noise cannot be fully mitigated. Therefore, the JWS identifies that, if the engine braking noise causes sleep disturbance, consideration could be given to acoustic treatment and ventilation of the bedrooms of the affected dwellings.
54. In summary Dr Chiles (Technical Assessment #2, paragraph 147) recommends the following measures to avoid, remedy or mitigate noise and vibration effects:
- a) Use of asphaltic road surfaces on Napier Road in Ashhurst and Vogel Street in Woodville;
 - b) Use of either asphaltic road surface or a concrete safety edge barrier from the eastern roundabout extending 1.5 km to the west of the roundabout;
 - c) That the Environmental and Cultural Design Frameworks (“ECDF”) include road environment design principles to encourage vehicles to make gradual speed changes approaching and departing from the two roundabouts;
 - d) Bold landscape treatments at roundabouts, separation of houses and roundabouts by 100 metres, and separation of houses and the alignment of the lower eastern slope by 200 metres. Upgrading the existing noise bund at Fitzherbert East Road is identified separately as a Project opportunity; and
 - e) Minimisation of construction traffic passing through Ashhurst at night.
55. I recommend that, where it is possible or practical, these recommendations should be carried through to the draft conditions.

8 Review of Submissions

Submission 103

56. Nicholas M Shoebridge submits that the proposed roundabout will generate increased noise resulting from construction and heavy traffic flows. The increased noise shall be to the extent that the character of the residential property will be no longer be

peaceful. The noise generated from this development affects his quality of life due to an unreasonable amount of damage and disturbance. He seeks that NZTA either purchase the residential property or move the roundabout structure to the furthest possible distance away from the property.

Submission 105

57. Barbara C M Cooke submits that noise created by construction and traffic which will affect the quality of life that can be enjoyed within the home (e.g. sleeping). The noise will have adverse health effects on the residents and animals in the area. The decision sought is for NZTA to purchase the property for a fair price to enable the purchase of a similar property.
58. Both of these submissions relate to 49846 Napier Road (SH3) Woodville. This is dwelling #56 on drawing number N-10 in Volume 4 of the NOR and its location is shown in Figure 1.



Figure 1. 49846 Napier Road (SH3) Woodville

59. The Woodville roundabout will be set back from this dwelling by at least 100 metres. Without noise mitigation there will be adverse noise impacts on the dwelling caused by traffic braking and accelerating. The operational traffic noise impacts will depend on the success of the noise mitigation measures, which include the provision of “bold landscape treatments” (Technical Assessment #2, paragraph 147) and moderation of user behaviour.

60. The JWS provides for a post-construction review to be undertaken in accordance with specification NZTA P40:2014. The review should include sound level measurements to verify noise modelling at critical locations (see paragraph 75 below).
61. The submitters seek that NZTA either purchase the dwelling or move the roundabout further away. There are potential adverse noise impacts for this dwelling. While I consider that the mitigation sought by the submitters cannot be provided for solely by way of conditions, I have recommended new conditions relating to the management of traffic noise and design of landscaping (see paragraph 113), and for further monitoring of traffic noise (see paragraph 114) to verify noise modelling (which is agreed in the JWS).

Submission 170

62. Murray Ramage owns a 50-acre block of land (Lot: 2 DP: 351133) (see *Figure 2* and *Figure 3*) which is at the rear of 75 Hope Road. The land has no dwellings and (I understand) no consent for any dwellings. The submitter has future plans to construct a dwelling as a lifestyle bock to retire on.
63. One building consent for a three-bay pole shed is recorded to the land. The building consent application was made in 2008 and a Code Compliance Certificate was issued in 2009.
64. The submitter seeks that the property be included as a directly affected property in the NOR, and to require NZTA to enter discussions and negotiations regarding suitable mitigation actions in terms of traffic noise.
65. Drawing N-09 in Volume 4 of the AEE indicates that the noise contours are lower on the submitter's land, but this is because the road is elevated on fill. This would not prevent the noise propagating over the submitter's land.
66. There are no dwellings on this land that qualify as PPFs in terms of NZS 6806. The submitter is correct that the noise of the road will significantly alter the existing aural environment at his property. As a result, the submitter seeks to negotiate with NZTA, however any negotiations with NZTA would otherwise be a private matter.

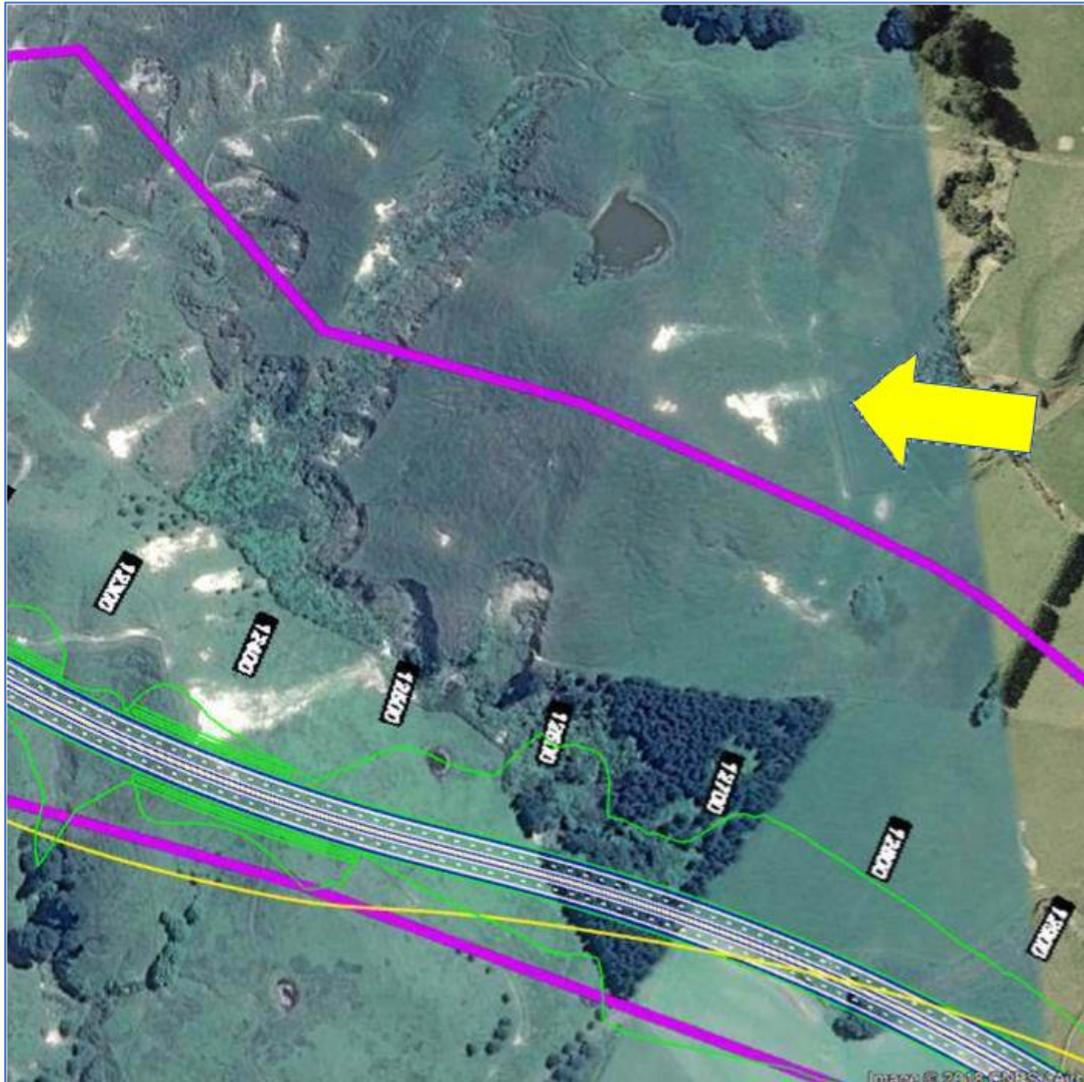


Figure 2. Arial 50 Acre block at rear of 75 Hope Road, Woodville (Ramage Property)

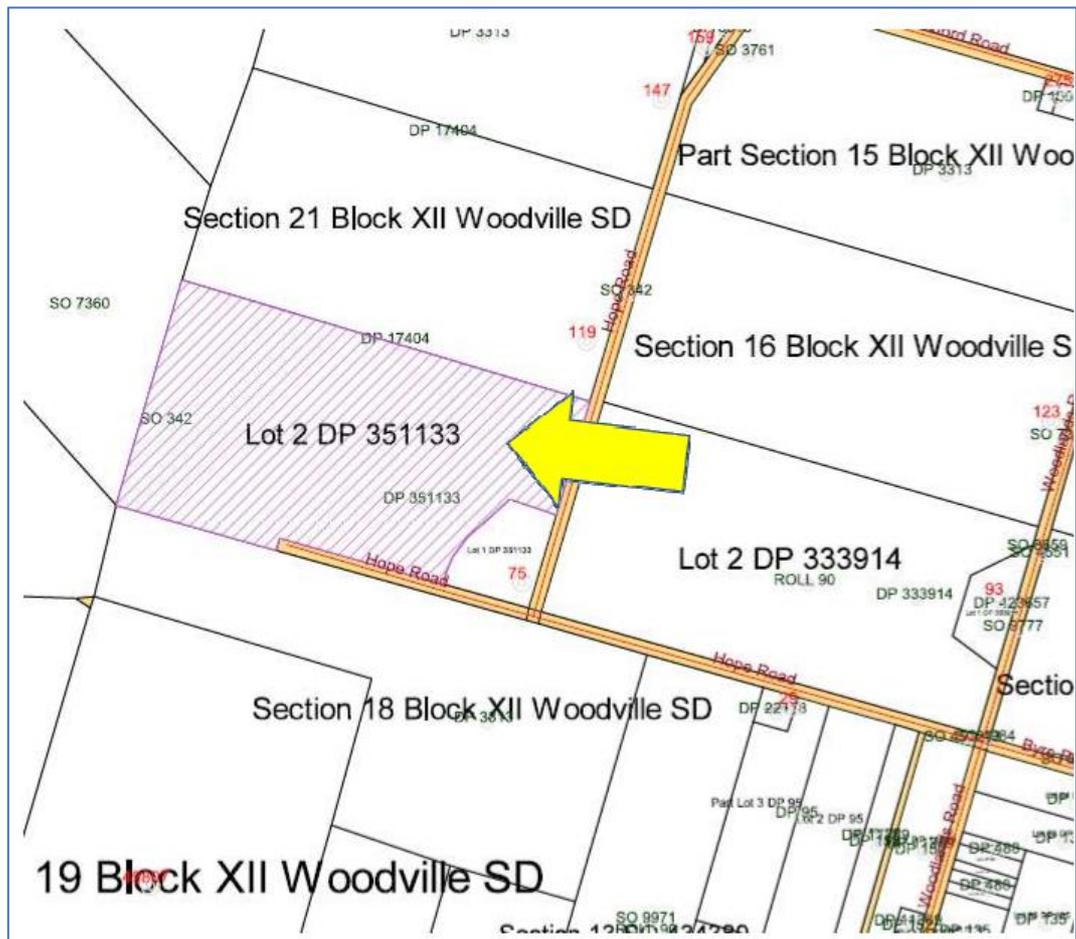


Figure 3. Cadastral 50 Acre block at rear of 75 Hope Road, Woodville (Ramage Property)

Submission 296

67. John and Wendy Napier reside at 75 Hope Road. They describe Hope Road as a quiet and tranquil rural area. They consider that high level of noise produced by busy roads with heavy traffic will have an impact on that lifestyle. They are concerned that wind direction will cause noise levels to be increased at their dwelling on a property already in direct line of the proposed traffic.
68. The submitters seek: an appropriate length three metre high concrete barrier or earth bund be installed and for low-noise road surface to be used. They also ask for the dwelling to be double glazed and an air conditioning or a heat pump installed to keep house cool in the summer when windows will have to be shut. If noise levels are

higher than predicted, then they ask for renegotiations with NZTA for financial compensation.

69. No assessment has been made specifically at this dwelling. The dwelling will also be subject to engine braking noise and would experience construction traffic noise if Hope Road was to be upgraded for use by heavy construction traffic in particular (as proposed in the NOR documentation).
70. The JWS recognises the difficulty in mitigating operational noise at this dwelling. This includes noise caused by supplementary braking noise on heavy vehicles that can be loud and distinct. Given that braking noise will occur on the lower section of the eastern slope, due to the long steep gradient, it is agreed that further consideration could be given to acoustic treatment and ventilation of bedrooms at this dwelling (and 49807 State Highway 3).
71. It is also agreed in the JWS that Hope Road shall not be used as an access for bulk haulage or regular heavy construction vehicles.

Submission 366

72. Nick Rogers & Tiffany Wendland reside at 1213 Fitzherbert East Road. They describe the proposed roundabout on Fitzherbert East Road (SH57) and SH3 as being very close to their dwelling. As a result, they consider that there will be high noise levels and seek to move the roundabout 250 metres to the east, away from their dwelling. They also ask that the earth noise mitigation bunds be moved westward to the "limit of works" and to extend the earth bund on the eastern side of the Fitzherbert East Road. The submitters provide a sketch of this concept.
73. The submitters seek that independent "before and after" noise tests be undertaken on the property and double glazing of windows, noise reduction installation, and a forced air system be considered for the dwelling as road noise may prevent windows being opened.
74. Dr Chiles does recommend that noise bunding be designed for this dwelling inside the designation and identifies that the existing bunding may not endure. This dwelling is at the corner of SH57 and SH3 and, accordingly, already experiences moderate traffic noise and the adverse noise impacts of vehicles braking and accelerating. Sound measurements were made at this dwelling as described at Appendix 2.C of Technical

Assessment #2. The average level over a 5-day period was calculated at 54 dB $L_{Aeq(24h)}$. Although this included one day when the sound level was measured at 58 dB $L_{Aeq(24h)}$, which could have been contaminated (probably by adverse weather conditions). Otherwise, the sound level was measured at between 49 dB and 53 dB $L_{Aeq(24h)}$ which averages to 51 dB $L_{Aeq(24h)}$ and is somewhat lower than the 56 dB calculated in Table 2.4 of Technical Assessment #2.

75. The different sound level measurements is important because the submitter seeks that independent “before and after” noise tests be undertaken on the property. It is agreed in the JWS that noise monitoring be undertaken as part of a post construction review. This will assist in ensuring that the noise mitigation envisaged by Dr Chiles is adequately provided for in the design and construct.
76. The separation from the new roundabout will be at least 100 metres but there will be a significant increase in traffic volume once the route is complete.
77. With the mitigation that is proposed, the predicted noise levels at this dwelling are not expected to increase by 2 dB over that which is predicted to currently exist (noting my concerns in paragraph 74 above) and will actually reduce against the predicted future (2041) scenario without the Project.
78. I recommend, therefore, that the noise bunding be installed (as recommended by Dr Chiles) and the post-construction review (as agreed by the JWS) needs to be designed to ensure that this process successfully achieves what it sets out to. I consider that a peer review approval (certification) process would assist with this.

Submission 238

79. Janette S McHugh resides at 95 Vogel Street. She identifies that noise pollution will occur on Vogel Street with heavy vehicles, including the shaking of home foundations. The submitter considers that Vogel Street residents have not been allowed a voice despite about 7,000 vehicles a day passing their properties. The submitter seeks that the residents of Vogel Street, Woodville have the right to propose that a ‘ring road’ be included in the plans for the new highway to detour heavy vehicles from this residential street.
80. It is agreed in the JWS that a ring road around Woodville has significant potential to reduce noise through parts of the town at least. No assessment has been made of this

option. The JWS states that a low noise asphalt road surface represents the best practicable option for controlling noise in Woodville. Obviously, this is in the event that there is not an alternative bypass provided for the town. The low noise asphalt road surface is probably the only serious mitigation option for Vogel Street (other than a ring road) given that noise screens are impracticable. Noise insulation and ventilation for noise sensitive activities are the only other mitigation measures but these would not reduce outdoor road traffic noise.

81. The noise mitigation method recommended by Dr Chiles is for a low-noise asphaltic road surface. Dr Chiles identifies that 39 PPFs in Woodville are currently predicted to be in categories B or C (of NZS 6806). The Project increases this number to 50 PPFs, which “materially worsens an already unsatisfactory situation where residents are above the recommended criteria”.⁴
82. Other than providing a ring road around Woodville, the JWS agrees that a low-noise road surface represents the best practicable method for controlling noise in Woodville. This is included as a draft condition 27 (for both Vogel Street in Woodville and SH3 between Cambridge Avenue and the Manawatu River).

Submission 239

83. Charleen M Cudby submits about the health impacts of the noise from the proposed route. The assessment is based on the recommendations of NZS 6806 which does factor in these considerations.

Submission 312

84. AgResearch Ltd is concerned with the construction effects and long-term environmental impacts on the wider Research Station. The key construction concerns relate to noise effects on stock, which could change the way stock graze the research blocks. During operation, it is unknown how the large traffic volumes and resultant noise effects will impact on animal health and how the stock may change their grazing patterns. All of which changes the existing research on pasture grazing systems.

⁴ Technical Assessment #2, paragraph 116.

85. The submitter considers that the mitigation proposed by NZTA is inadequate and does not address the primary effects. AgResearch seeks the following relief:
- a) NZTA undertakes additional assessments of effects to account for the above;
 - b) NZTA amends the designation route to avoid the long-term phosphorus fertiliser and sheep grazing experiment on Ballantrae;
 - c) NZTA amends the planned construction activities to ensure an adequate buffer around the long-term phosphorus fertiliser and sheep grazing at Ballantrae to avoid offsite effects; and
 - d) NZTA amends the conditions to provide certainty that construction effects will not impact on the long-term phosphorus fertiliser and sheep grazing experiment at Ballantrae.
86. No assessment has been undertaken of the noise impacts of the operational traffic noise and construction works on the AgResearch land. Dr Chiles indicates in the JWS that further information is to be provided to this submission in his evidence.

Submission 369

87. Department of Conservation identifies that the Project has the potential to result in adverse noise and amenity effects on users of the Manawatu Gorge Scenic Reserve (“**Scenic Reserve**”) in the vicinity of the carpark. The Assessment of Landscape, Natural Character and Visual Effects (NOR Volume 3.4) rates the area around the Scenic Reserve carpark as having a moderate/high level of natural character and identifies it as being sensitive to change due to shared and recognised values held by the community. Other technical assessments in the NOR have not had adequate regard to the potential adverse effects on this area, both during and after construction.
88. Additional detail is required to ensure measures to avoid, remedy and mitigate these potential adverse effects, including but not limited to the re-establishment of the carpark in a way that provides for similar natural character and amenity.
89. No assessment has been made of the amenity levels at the DOC reserve. However, it will be inevitable that operation and construction noise will impact at the western end of the reserve in particular. The extent of the area of DOC land affected by operational

noise can be estimated from the outer edge of the blue contour shown on Drawing N-05 in Volume 4 of the AEE.

90. Dr Chiles indicates in the JWS that further information is to be provided to this submission in his evidence.

Submission 375

91. The Manawatu Chamber of Commerce urge NZTA to seriously look at all future-proofing considerations. In their submission, the future proofing considerations include consideration of the effects of traffic (potential of up to 12,000 vehicles per day, including 50 metre trucks, going through the High Street and past the primary school) on Woodville and its businesses and residents. Options for a ring-road need to be considered that do not disadvantage existing businesses but support the residents, and accounting for the social impacts such as safety and noise.
92. As agreed in the JWS, a ring road would significantly reduce the additional noise from the proposed route that adds to the presently unsatisfactorily high road traffic noise levels. Other than the provision of the ring road, the proposed noise mitigation of providing low-noise road surface represents the best practicable option.

9 Draft Requirement Conditions

93. The various plans and ECDF provide for noise mitigation matters. These mitigation measures will be implemented during the future detailed design process and construction works. A number of these matters are needed to avoid or mitigate identified noise effects, but for which only descriptive (rather than prescriptive or standard based) noise management controls are currently available. These measures include “bold landscaping” (to acoustically screen the route) and “driver behavioural controls” to (reduce the noise from passing vehicles by encouraging them not to brake or accelerate abruptly at roundabouts).
94. It is proposed (and agreed in the JWS) that a post-construction review should be undertaken in accordance with specification NZTA P40:2014, which shall take place after the route starts to operate (and up to one year after this). It is important, therefore, that checks and balances form part of the detailed design stage of the Project to ensure that “bold landscaping” includes effective noise screening for

neighbours. I consider that this is best achieved by introducing a peer review process. One method of achieving this is by giving the Territorial Authorities the authority to approve (or certify) that the various plans (ECDF, CNVMP, CTMP) appropriately avoid or mitigate noise in accordance with the predictions, modelling and recommendations of Technical Assessment #2.

95. The relevant draft requirement conditions for noise are found in:

- a) Condition 5, which requires that the outline plan(s) demonstrate how the following is achieved:
 - i. Traffic lanes of the roundabouts must be more than 100 metres from dwellings existing on 31 October 2018;
 - ii. Traffic lanes must be more than 200 metres from the dwellings at 49807 State Highway 3 and 75 Hope Road, Woodville existing on 31 October 2018;
- b) Condition 19 – construction noise limits;
- c) Condition 20 - construction vibration limits;
- d) Condition 21 – construction noise and vibration plan;
- e) Condition 22 – construction traffic management plan;
- f) Condition 27 – low-noise road surface requirement;
- g) Condition 28 – traffic separation at roundabouts and from dwellings on the eastern slope; and
- h) Condition 29 – further noise mitigation for dwellings proximate to the eastern slope.

96. Dr Chiles agrees that, subject to Chris Bentley’s consideration, a specific bullet point should be added in the ECDF relating to the roundabout treatments and another relating to the bund. Section 3.6 of the ECDF provides principles in respect of the treatment of roundabouts. Enhancing the existing bund is listed as a Project opportunity in section 2.4.

97. Condition 5 – The separation of requirements that must be identified in the outline plan(s) are specifically provided for in condition 28, which I consider to be appropriate.
98. Condition 19 – sets the construction noise limits. The condition is discussed in the JWS with agreement to remove “(15 min)” from $L_{Aeq(15\text{ min})}$ in the column heading. This fifteen-minute averaging time is not provided for in NZS 6803.
99. It is agreed in the JWS that the adjoining time periods in the table of condition 9 should revert to those set out in Table 2 of NZS 6803 rather than the amalgamation recommended in the draft conditions. It is also agreed that the wording in condition 19 prior to the table should read:

All construction work must be designed and conducted to ensure that, as far as practicable, construction noise does not exceed the limits in the following table. Sound levels must be measured and assessed in accordance with the provisions of NZS 6803:1999 Acoustics – Construction noise:

Time of week	Time period	L_{Aeq}	L_{Amax}
Weekdays	0630-0730	55 dB	75 dB
	0730-1800	70 dB	85 dB
	1800-2000	65 dB	80 dB
	2000-0630	45 dB	75 dB
Saturdays	0630-0730	45 dB	75 dB
	0730-1800	70 dB	85 dB
	1800-2000	45 dB	75 dB
	2000-0630	45 dB	75 dB
Sundays and public holidays	0630-0730	45 dB	75 dB
	0730-1800	55 dB	85 dB
	1800-2000	45 dB	75 dB
	2000-0630	45 dB	75 dB

100. I have had some discussion with the Councils’ Reporting Team regarding the wording “as far as practical” in condition 19 on the basis that it anticipates occasions where the limits may be exceeded. I consider and expect that the noise limits in the table will be complied with almost all of the time. However, construction work will take place on the roundabouts and it is conceivable that night-time construction work could be

necessary close to dwellings (say on Vogel Street or SH3 near Ashhurst) when some exceedance of the limits may be unavoidable. I consider that it is reasonable to provide for such works on the basis that alternative strategies are included as part of the CNVMP. These alternative strategies would focus on noise mitigation measures in the specific circumstances of the work and could involve consultation with the affected parties and the provision of temporary alternative accommodation where the works were of a longer-term nature.

101. Condition 20 – The construction vibration condition establishes Category A and Category B controls. There is agreement in the JWS that the vibration criteria should be amended to specify how Category A and B criteria are applied. Dr Chiles recommends that the Category A and B criteria for construction vibration should have been developed in condition 20 with the following:

The Category A construction vibration criteria in Table [X] must be complied with as far as practicable. If measured or predicted vibration from construction activities exceeds the Category A criteria, a suitably qualified person must assess and manage construction vibration during those activities. If measured or predicted vibration from construction activities exceeds the Category B criteria those activities must only proceed if vibration effects on affected buildings are assessed, monitored and mitigated by a suitably qualified person.

102. With respect to this condition, I consider that approval or certification by the Territorial Authorities would also be appropriate with condition 20 in the event that Category A criteria is to be exceeded.

103. Condition 21 - Sets out the matters to be included in the CNVMP. There are two additional matters that I recommend be included in the CNVMP as a minimum as follows:

- a) Likely noise and vibration emissions; and
- b) Alternative mitigation strategies where compliance with condition 19 and 20 may not be achieved.

104. I also recommend that an addition be included in condition 21 that requires construction work be undertaken in accordance with the CNVMP.

105. With respect to this condition, I consider that approval or certification by the Territorial Authorities would be appropriate with the condition 21 CNVMP to establish that the matters required by condition 21 and Annex E2 of NZS 6803 have been adequately considered.
106. Condition 22 - Sets out the matters to be considered by the CTMP. Condition 22(g) is to describe the methods to limit the movement of heavy vehicles through Ashhurst at night and at peak times. Agreement was reached in the JWS that the designation conditions should require that construction traffic be avoided through Ashhurst and Woodville at night. Essential movements such as continuous concrete pours and over-dimension loads are exempt. Night-time heavy vehicles have the potential to cause significant noise impacts on the Ashhurst community and I recommend that this condition be strengthened as follows:
- g) describe methods to limit the movement of heavy vehicles through Ashhurst at peak times and to avoid the movement of heavy vehicles through Ashhurst at night.*
107. The suggested wording goes further than the proposed wording in the RFI response. I consider that it is important that emphasis be placed on avoiding heavy vehicle through Ashhurst at night unless absolutely necessary for a specific construction activity (such as a continuous concrete pour).
108. The JWS states that Hope Road should not be used as an access for bulk haulage and regular heavy construction vehicles and I consider this should also be included as a designation condition.
109. Condition 27 - Prescribes that low-noise road surfacing should be laid on SH3 Napier Road between Cambridge Avenue and the Manawatu Bridge and on Vogel Street in Woodville. This option represents the best practicable option to control noise levels for these areas (in the absence of a ring-road around Woodville).
110. Condition 28 - Sets out the traffic separation distances which I consider to be reasonable in the circumstances of this Project.
111. Condition 29 - Attempts to provide for noise mitigation for the dwellings at 49807 SH3 and 75 Hope Road. This is in addition to the 200 metre separation distances required by condition 28. The JWS recognises that the noise of engine braking cannot be fully

mitigated. If it causes sleep disturbance, consideration could be given to acoustic treatment and ventilation of bedrooms at 49807 State Highway 3 and 75 Hope Road.

112. The assessment is that these dwellings will be exposed to engine braking noise from trucks descending the eastern slope, and that this noise will be significant compared to the existing quiet background sound environment.

113. I recommend that a condition be included as follows:

Operational traffic noise shall be managed in accordance with NZS 6806:2010 Acoustics – Road-traffic noise – New and altered roads except where these conditions conflict with those recommendations. The road environment at roundabouts must be designed to result in vehicles braking and accelerating gradually rather than abruptly. The landscape design process shall integrate and maximise noise mitigation. Where engine braking noise causes sleep disturbance, consideration must be given to acoustic treatment and ventilation of bedrooms at 49807 State Highway 3 and 75 Hope Road.

114. Traffic noise levels will be measured prior to and subsequent to the construction of the route (without construction noise) to verify noise modelling at 49807 Napier Road (SH3), 49846 Napier Road (SH3), 75 Hope Road, and 1213 Fitzherbert East Road.

10 Conclusions

115. I consider that Technical Assessment #2 provides an appropriate assessment of adverse operational and construction noise and vibration effects, subject to the comments set out in my evidence.

116. I undertook expert noise conferencing with Dr Stephen Chiles (for NZTA) on 13 February 2019. In that conferencing we set out the issues, statements and agreed positions and were in general agreement on the acoustics issues including operational and construction noise and vibration. We did not record any areas of disagreement. The JWS is attached to my evidence at **Appendix A**.

117. Key issues discussed in the JWS include the mitigation of noise at roundabouts at either end of the route and how these conceptual noise control measures can be implemented by frameworks/plans and the checks and balances required.

118. Engine breaking noise on the long steep eastern slope is identified as a key issue along with the possible need to provide noise insulation and ventilation to the closest dwellings to the route.
119. Recommendations are made on the wording of draft conditions with respect to operational noise and vibration and construction works.

Nigel Robert Lloyd

1 March 2019

APPENDIX A - Joint Witness Statement

IN THE MATTER OF

the Resource Management Act 1991

AND

IN THE MATTER OF

Notices of requirement for designations under section 168 of the Act, in relation to Te Ahu a Turanga; Manawatū Tararua Highway Project

BY

NEW ZEALAND TRANSPORT AGENCY
Requiring Authority

JOINT STATEMENT OF ACOUSTICS EXPERTS

13 February 2019

INTRODUCTION

1. This joint witness statement relates to expert conferencing on the topic of acoustics.
2. This joint witness statement relates to the notices of requirement lodged by the New Zealand Transport Agency ("**Transport Agency**") for designations under section 168 of the Resource Management Act 1991 ("**RMA**"), in relation to Te Ahu a Turanga; Manawatū Tararua Highway Project (the "**Project**").
3. The expert conferencing was held on Wednesday, 13 February 2019 in Wellington.
4. Attendees at the conference were:
 - (a) Dr Stephen Chiles (Chiles Ltd) for the Transport Agency; and
 - (b) Nigel Lloyd (Acousafe) for the Manawatū District Council, Tararua District Council, and Palmerston North City Council ("**Councils**").

CODE OF CONDUCT

5. This joint statement is prepared in accordance with section 4.7 of the Environment Court Practice Note 2014.
6. We confirm that we have read the Environment Court Practice Note 2014, and in particular Appendix 3 – Protocol for Expert Witness Conferencing, and agree to abide by it.
7. Dr Chiles' qualifications and experience are set out in paragraph 5 of Technical Assessment 2. Mr Lloyd's qualifications and experience are set out in Annexure A.

PURPOSE AND SCOPE OF CONFERENCING

8. The purpose of conferencing was to identify, discuss, and highlight points of agreement and disagreement on operational and construction noise and vibration issues arising from the notices of requirement relating to the Project, and the submissions received in relation to them.
9. The scope of the conferencing generally has not included development of wording for designation conditions, other than in relation to application of technical standards.

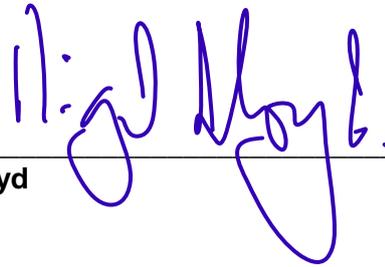
RECORD OF CONFERENCING

10. Annexure B sets out the issues, statements and agreed positions we have discussed. We are generally in agreement on acoustics issues and have not recorded any areas of disagreement.

Date: 13 February 2019



S Chiles



N Lloyd

ANNEXURE A

Qualifications and experience of Nigel Lloyd

1. My full name is Nigel Robert Lloyd. I hold the qualification of a degree in mechanical engineering gained at the University of Wales, University College Cardiff in 1976. I am a Member of the Acoustical Society of New Zealand and the Association of Australasian Acoustical Consultants and I have completed a 'Making Good Decisions' course.
2. I am an acoustical consultant, with 42 years of experience in noise control and acoustical consultancy.
3. I have advised Palmerston North City Council and Manawatu District Council on their District Plan noise reviews respectively.
4. I have undertaken peer reviews for the following roading proposals:
 - i. SH1 Hamilton City Bypass - 2004
 - ii. SH50A Hawkes Bay Expressway – 2006
 - iii. Hastings Northern Arterial – 2008
 - iv. Transmission Gully – 2012
 - v. Christchurch Southern Motorway Stage II - 2016
 - vi. SH3 Mt Messenger - 2018.

ANNEXURE B

In the matter of notices of requirement for designations under section 168 of the Resource Management Act 1991, in relation to Te Ahu a Turanga; Manawatū Tararua Highway Project.

Expert conferencing – Acoustics

Participants: Stephen Chiles (SC), Nigel Lloyd (NL)

Issue	Statements	Agreed Position
Noise and vibration assessment methodology	<p>In Technical Assessment 2 the following primary standards have been applied:</p> <ul style="list-style-type: none"> • Operational noise – NZS 6806 • Operational vibration – NS 8176E • Construction noise – NZS 6803 • Construction vibration – BS 5228-2, DIN 4150 	<p>Technical Assessment 2 provides an appropriate assessment of adverse operational and construction noise and vibration effects, subject to the comments set out in this table.</p>
Existing sound environment	<p>Unlike most road projects, the section of road being replaced by this Project is already closed. This has altered the current noise environment.</p>	<p>The existing sound environment is to be taken as that currently experienced by the community, as opposed to the situation prior to the closure of the Gorge road.</p>
NZS 6806 categorisation of houses near to the proposed roundabouts.	<p>NZS 6806 recommends different noise criteria depending on whether houses are near to a new or altered section of road. The criteria by new roads are more stringent.</p> <p>The main section of the Project is a new road.</p>	<p>Categorisation of the Project near the roundabouts is complicated by parts of the existing designated SH3 which do not currently carry state highway traffic volumes. As such neither the new or altered road definitions should be relied on in isolation. Development of noise mitigation near the roundabouts should be focused on achieving the best practicable option to manage sound characteristics associated with vehicles braking and accelerating.</p>

Assessment locations	<p>NZS 6806 requires assessment of noise at “Protected Premises and Facilities” which does not address future houses, car park/information areas, or farmland.</p> <p>SC – Further information will be provided in evidence in response to the submissions by the Department of Conservation and AgResearch.</p>	<p>Noise effects have not been assessed at locations where future noise sensitive development might occur. To our knowledge there are no unimplemented building consents for future houses in the vicinity of the Project.</p> <p>Noise effects at the Manawatū Gorge Scenic Reserve western car park and information area were only briefly addressed in Technical Assessment 2. Given the function of the car park area this is not a significant issue.</p> <p>Technical Assessment 2 did not explicitly assess noise effects at the Ballantrae Hill Country Research Station.</p>
Design of the road environment at roundabouts.	<p>SC – Based on discussions with Chris Bentley it is expected there will be substantial tree plantings around the two roundabouts to clearly signal the change in speed environment. Other measures may include lighting, road markings and signage.</p>	<p>Roundabouts should be at least 100 metres from houses. Increasing this distance would also provide a benefit.</p> <p>The road environment at roundabouts needs to be designed to result in vehicles braking and accelerating gradually rather than abruptly. The landscape design process needs to integrate and maximise noise mitigation.</p>
Heavy vehicle engine braking noise on the lower eastern slope	<p>Certain types of supplementary braking systems on heavy vehicles generate a loud and distinctive noise. Such engine braking will occur on the lower eastern slope due to the long steep gradient.</p>	<p>The noise of engine braking cannot be fully mitigated. If this noise causes sleep disturbance, consideration could be given to acoustic treatment and ventilation of bedrooms at 49807 State Highway 3 and 75 Hope Road.</p>
Operational road-traffic vibration	<p>Road-traffic vibration normally only causes effects at buildings adjacent to a road, unless the surface or pavement have defects.</p>	<p>There are no dwellings close enough to the new and altered roads such that operational vibration is an issue. This relies on the Transport Agency properly maintaining the roads.</p>

<p>Post-construction review</p>	<p>The assumptions made in Technical Assessment 2 need to be maintained throughout the implementation of the Project.</p>	<p>A post-construction review should be undertaken in accordance with specification NZTA P40:2014. This should include sound level measurements to verify noise modelling at: 49807 Napier Road (SH3), 49846 Napier Road (SH3), 75 Hope Road, and 1213 Fitzherbert East Road</p>
<p>Woodville bypass</p>	<p>The Project connects to the State Highway network to the west of Woodville and most traffic will pass through the town centre on Vogel Street. There are currently adverse noise effects from traffic on Vogel Street and this will be increased with the Project. There are limited ways to mitigate this issue unless traffic is rerouted away from Vogel Street.</p>	<p>A ring road around Woodville has significant potential to reduce noise through parts of the town at least. A low noise asphalt road surface is less effective at low speed and does not reduce heavy vehicle engine noise. However, a low noise road surface on Vogel Street represents the best practicable option for controlling noise in Woodville.</p>
<p>Construction noise limits</p>	<p>The long-term duration noise limits from NZS 6803 have been selected for the Project and are included in proposed designation condition 19.</p>	<p>The construction noise criteria in proposed condition 19 should be amended to remove “(15 min)” from the column heading. The criteria in proposed condition 19 are the long-term values from NZS 6803, but some of the adjoining time periods have been amalgamated. To avoid confusion these should revert to the format and time periods from NZS 6803. The wording in condition 19 should be amended to read “All construction work must be designed and conducted to ensure that, as far as practicable, construction noise does not exceed the limits in the following table. Sound levels must be measured and assessed in accordance with NZS 6803:1999 <i>Acoustics – Construction noise.</i>”</p>

Construction vibration criteria	<p>SC - The Category A and B criteria for construction vibration have been developed to be applied in accordance with the following:</p> <p><i>“The Category A construction vibration criteria in Table [X] must be complied with as far as practicable. If measured or predicted vibration from construction activities exceeds the Category A criteria, a suitably qualified person must assess and manage construction vibration during those activities. If measured or predicted vibration from construction activities exceeds the Category B criteria those activities must only proceed if vibration effects on affected buildings are assessed, monitored and mitigated by a suitably qualified person.”</i></p>	The proposed designation condition 20 for construction vibration criteria should be amended to specify how Category A and B criteria are applied.
Construction Noise and Vibration Management Plan (CNVMP)	Proposed designation condition 21 includes various requirements to be addressed by a CNVMP.	<p>Designation condition 21 should also require:</p> <ul style="list-style-type: none"> • Construction to be conducted in accordance with the CNVMP, • The CNVMP to establish likely construction noise emissions, • The CNVMP to set out alternative mitigation strategies where compliance with the noise/vibration limits may not be achieved.
Construction traffic	<p>While there is already significant heavy traffic through Ashhurst and Woodville on a 24 hour basis, further intense heavy vehicle movements at night would aggravate existing issues.</p> <p>Background (L_{A90}) sound levels measured at 75 Hope Road are in the order of 30 dB L_{A90} at night.</p>	<p>Designation conditions should require that construction traffic be avoided through Ashhurst and Woodville at night, other than essential movements such as continuous concrete pours and over-dimension loads.</p> <p>Hope Road should not be used as an access for bulk haulage or regular heavy construction vehicles.</p>