

**BEFORE THE TARANAKI REGIONAL COUNCIL AND NEW PLYMOUTH
DISTRICT COUNCIL**

MT MESSENGER BYPASS PROJECT

In the matter of the Resource Management Act 1991

and

In the matter of applications for resource consents, and a notice of requirement by the NZ Transport Agency for an alteration to the State Highway 3 designation in the New Plymouth District Plan, to carry out the Mt Messenger Bypass Project

**STATEMENT OF EVIDENCE OF DAMIAN PAUL ELLERTON
(NOISE AND VIBRATION) ON BEHALF OF THE NZ TRANSPORT AGENCY**

25 May 2018

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QUALIFICATIONS AND EXPERIENCE

1. My name is Damian Paul Ellerton.
2. I am an acoustic consultant at Marshall Day Acoustics Limited.
3. I hold a Science degree from Waikato University majoring in Earth Sciences (soils), and a Master of Science Degree in Environmental Acoustics from South Bank University in London, England. I have worked in the field of acoustics for more than 20 years. I am an accredited RMA Hearings Commissioner.
4. I confirm that I have read the 'Code of Conduct' for expert witnesses contained in the Environment Court Practice Note 2014. My evidence has been prepared in compliance with that Code. In particular, unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

EXECUTIVE SUMMARY

5. Noise and vibration effects from the proposed Mt Messenger Bypass Project have been assessed considering the Resource Management Act 1991 ("**RMA**") obligations, relevant New Zealand Standards and the NZ Transport Agency ("**Transport Agency**") guidelines.
6. Having reviewed the work of my colleague Shaun King, I predict that traffic noise generated by the Mt Messenger Bypass project ("**Project**") will comply with NZS 6806:2010 without any specific acoustic mitigation. Overall traffic noise effects are considered acceptable.
7. I consider that potential traffic vibration effects at all dwellings will be negligible.
8. Construction noise levels at the small number of nearby dwellings are predicted to comply with the daytime criteria set out in New Zealand Standard NZS6803:1999. There are two possible exceptions:
 - (a) 2397 Mokau Road, which is in close proximity to a spoil disposal area and may require mitigation such as a solid site hoarding and appropriate on site management to avoid unnecessary noise. I understand that this dwelling may well be rented and / or occupied by the Transport Agency during the construction period; and
 - (b) night works in close proximity to dwellings, which will require management measures to ensure adverse effects are mitigated as much as practicable.
9. Construction vibration levels are predicted to comply with the Transport Agency guidelines, which are deemed acceptable.

10. I recommend that a Construction Noise Management Plan ("**CNMP**") be implemented for the construction phase.

BACKGROUND AND ROLE

11. The Transport Agency engaged Marshall Day Acoustics to advise it on its proposed Project to improve the section of State Highway 3 ("**SH3**") between Ahititi and Uruti, to the north of New Plymouth.
12. Shaun King, my colleague at Marshall Day Acoustics, prepared the Environmental Noise and Vibration Assessment included as Technical Report 10, Volume 3 of the Assessment of Environmental Effects ("**AEE**") for the Project. Mr King was also involved in the earlier multi-criteria analysis of alternative route options for the Project.
13. Mr King also prepared the final draft CNMP attached to Mr Peter Roan's evidence on conditions and management plans.
14. Mr King is unable to present evidence due to circumstances outside his control. I was subsequently asked to review the relevant materials and prepare this evidence. I have read the AEE report Mr King prepared, as well as the final draft CNMP. I agree with the conclusions reached in the Noise and Vibration Assessment, and the measures set out in the CNMP. I am to a large extent relying on those documents, and the conclusions reached by Mr King, in presenting my evidence.

SCOPE OF EVIDENCE

15. The purpose of my evidence is to discuss the potential noise and vibration effects of the Project (both during construction and once the highway is operational), as well as the measures being adopted to address potential adverse acoustic effects.
16. My evidence addresses:
 - (a) the relevant standards and guidelines for assessing noise and vibration effects of the Project;
 - (b) the methodology employed for assessing noise and vibration effects;
 - (c) the existing noise environment;
 - (d) an assessment of the potential noise and vibration effects of the Project on nearby residences, both during construction and once the highway is operational;
 - (e) the measures being employed to address potential effects; and
 - (f) responses to submissions and the Section 42A Reports.

STANDARDS AND GUIDELINES

17. The Standards and Guidelines which have been used to undertake the noise and vibration assessment are;
- (a) New Zealand Standard NZS 6806:2010 "*Acoustics - Road-traffic noise - New and altered roads*" ("**NZS 6806**");
 - (b) New Zealand Standard NZS 6803:1999 "*Acoustics - Construction Noise*";
 - (c) NZ Transport Agency State Highway construction and maintenance noise and vibration guide (August 2013) ("**Transport Agency Guide**");
 - (d) German Standard DIN 4150-3:1999 "*Structural Vibration - Effects of Vibration on Structures*"; and
 - (e) British Standard BS 5228-2:2009 "*Code of practice for noise and vibration control on construction and open sites Part 2: Vibration*".

Operational Noise

18. In accordance with NZS 6806 the dwellings adjacent to the route have been assessed under the altered road category.¹ The Standard considers this is a special case due to the proximity of the dwellings to the existing road.
19. I have provided the relevant criteria from NZS 6806 for an altered road in **Table 1** below.

Table 1: Relevant NZS 6806 criteria for 'altered roads'

Category	Altered Roads (dB L _{Aeq(24h)})
A (primary external noise criterion)	≤ 64
B (secondary external noise criterion)	64-67
C (internal noise criterion)	40

20. The applicable criterion depends on the best practicable option ("**BPO**") test. Where noise levels within Category A can be achieved with the implementation of the BPO for noise mitigation, then Category A applies. Where Category A cannot practicably be achieved, then mitigation to achieve the noise criteria within Category B is subject to the BPO test. If the noise criteria of Categories A or B are not practicably achievable, then the "backstop" Category C shall be met with the adoption of the BPO.

¹ NZS 6806 requires assessment for dwellings within 200m of the new alignment in rural areas.

Operational vibration

21. No operational vibration criteria in the overall assessment. This is because the risk of adverse vibration effects from poorly maintained roads is considered low at distances greater than 25 metres. All dwellings are significantly further from the road, with the closest dwelling being over 100 metres away.

Construction noise

22. The New Plymouth District Plan contains noise limits relating to construction within the Rural Environment Area.² These limits are loosely based on the superseded provisional construction noise standard NZS 6803P:1984.
23. I recommend for this Project that the current standard NZS 6803:1999 be adopted instead of the rule in the New Plymouth District Plan. I consider this the most appropriate Standard for assessing construction noise from the Project and best practice.
24. The relevant constructions noise limits from NZS 6803:1999 are:
 - (a) 70 dB L_{Aeq} and 85 dB L_{AFmax} during the day; and
 - (b) 45 dB L_{Aeq} and 75 dB L_{AFmax} at night.

Construction vibration

25. The Transport Agency Guide adopts the German (DIN 4150) and British (BS 5228-2) standards, and applies them in a progressive manner that addresses both annoyance and avoidance of building damage effects.
26. I consider the standards adopted by the Guide appropriate to assess both amenity and avoidance of building damage from vibration generated by construction activities.

ASSESSMENT METHODOLOGY

Traffic noise

27. The assessment of traffic noise effects was based on a two-stage approach as described below:
 - (a) an assessment in accordance with NZS 6806 following the BPO process for noise mitigation and focussing on achieving the most stringent noise criteria category practicable; and
 - (b) an assessment of noise effects (both beneficial and adverse) through determination of noise level changes, based on **Table 2** below.

² See Appendix 12.1 STD 7.11 and 7.12 of the New Plymouth District Plan.

Table 2: Assessment of perception and impact of noise level changes

Noise level change	General subjective perception ³	Impact
1-2 decibels	Insignificant / imperceptible change	Negligible
3-4 decibels	Perceptible change	Slight
5-8 decibels	Appreciable change	Noticeable
9-11 decibels	Halving/doubling of loudness	Substantial
>11 decibels	More than halving / doubling of loudness	Serious

28. NZS 6806 uses the terms 'Do-nothing' and 'Do-minimum' scenario, which are also referred to in the assessment of noise effects. These terms are described below;
- (a) do-nothing describes the existing SH 3 road at the design year with increased traffic volumes; and
 - (b) do-minimum describes the Project road at the design year without any specific noise mitigation.
29. NZS 6806 only assesses noise effects at noise sensitive locations. The standard refers to these locations as Protected Premises and Facilities ("**PPFs**").
30. For the Project, three PPFs were identified in general accordance with the standard, which are listed below:
- (a) 2528 Mokau Road;
 - (b) 2750 Mokau Road;⁴ and
 - (c) 3072 Mokau Road.

Construction noise

31. The noise level predictions for this Project consider the sound power levels of each potential item of equipment, and models the noise propagation characteristics over distance, including the effects of ground and air absorption.
32. Indicative noise levels were calculated in accordance with International Standard ISO 9613-2:1996 "*Acoustics - Attenuation of sound during*

³ Based on research by Zwicker & Scharf (1965); and Stevens (1957, 1972).

⁴ It is noted that the dwelling at 2750 Mokau Road is outside this distance included in NZ 6806, but has been considered a PPF for this Project at the request of the Project Team.

propagation outdoors - Part 2: General method of calculation" for all relevant construction scenarios, assuming multiple items of equipment operating simultaneously.

33. This approach is deliberately conservative in order to represent the reasonable worst-case noise levels that may infrequently occur.

Construction vibration

34. Safe setback distances have been predicted based on vibration measurements previously performed for high vibration sources such as vibropiling and vibrating rollers. These were cross-checked against empirically derived relationships contained in BS 5228-2:2009 "*Code of practice for noise and vibration control on construction and open sites Part 2: Vibration*".
35. The results from these measurements and predictions have been used to determine risk radii within which buildings are at low, medium or high risk of building damage. The risk radii also consider human annoyance effects.

EXISTING NOISE ENVIRONMENT

36. My colleague Mr Arthur Postles undertook noise measurements in the road reserve of SH3 adjacent 2528 Mokau Road and 3072 Mokau Road.⁵ These measurements were dominated by traffic noise.
37. These measurements were used to verify the computer noise model of the existing SH3.
38. The noise model was then used to predict the existing ambient noise level at each PPF.
39. The ambient noise levels ranged between 46 and 55 dB $L_{Aeq(24h)}$ at the PPFs, which is considered a low to moderate noise environment.⁶

ASSESSMENT OF POTENTIAL NOISE AND VIBRATION EFFECTS

Traffic noise

40. The Noise and Vibration Assessment predicted that the noise level at all PPFs would be within the Category A of NZS 6806 limits once the road is operational, which is the most stringent category.⁷ Therefore, no mitigation

⁵ Maps showing the noise survey locations are included in Environmental Noise and Vibration Assessment in Appendix A.

⁶ Maps showing the predicted existing noise levels are included in Environmental Noise and Vibration Assessment in Appendix B.

⁷ Maps showing the predicted do-minimum noise levels are included in Environmental Noise and Vibration Assessment in Appendix D.

was proposed as full compliance with Category A of NZS 6806 had been achieved. In particular:

- (a) at 2750 Mokau Road it is predicted that the traffic noise level will reduce by 4 decibels which is considered a slight improvement;
- (b) at 2528 Mokau Road it is predicted that the traffic noise level will reduce by 1 decibel which is considered a negligible change;
- (c) at 3072 Mokau Road it is predicted that the effects will vary depending on the part of the house affected by traffic noise. This is the result of the altered orientation of the highway in relation to the house following construction of the Project:
 - (i) it is predicted that traffic noise at the most affected (north-eastern) façade will increase by 3 decibels to 54 dB $L_{Aeq(24h)}$, which is considered a just perceptible change. The north-eastern façade is affected by the existing SH3 and will continue to be affected by the new road alignment;
 - (ii) at the south-eastern façades, which are currently facing away from the road and are therefore exposed to lower levels of traffic noise, it is predicted that traffic noise will increase by up to 17 decibels to 53 dB $L_{Aeq(24h)}$ due to the new road alignment. An increase of 17 decibels is more than a doubling of loudness and overall is considered a substantial increase in traffic noise for these façades; and
 - (iii) conversely, the north-western façades of the dwelling are currently exposed to traffic noise from SH3, and predicted a decrease of up to 12 decibels is predicted. Subjectively noise at this façade will be approximately half what it currently is.

41. Overall, the predicted Do-minimum traffic noise levels at the PPFs are low to moderate and are considered acceptable, even with the predicted noise level increases. In my opinion, these noise levels would not result in adverse effects on residential activities.

Traffic vibration

42. The traffic vibration risk has been assessed through a review of data for heavy vehicles travelling on existing roads with a range of surface conditions. The data indicates that compliance with the NZTA traffic vibration criterion (Class C of the Norwegian Standard NS 8176.E:2005) can be achieved at 25 m from the road edge, even for roads in a degraded state. There are no dwellings within 25 m of the Project alignment.

Construction noise

43. I recommend that a Construction Noise Management Plan ("**CNMP**") be implemented during the construction phase of the Project.
44. I understand that the dwelling at 3072 Mokau Road will be vacant during construction. Therefore, I have not assessed construction noise or vibration at this building.
45. In addition to 2750 Mokau Road and 2528 Mokau Road, I have included 2397 Mokau Road in the construction assessment as this dwelling is close to the spoil disposal area located at the southern end of the Project. These are the only dwellings potentially affected by construction noise arising from the Project. I understand that 2397 is reasonably likely to be occupied and / or rented by the Transport Agency during the construction period. However, I have assumed for the purposes of my evidence that this dwelling may be occupied by a third party during construction.
46. I understand that 24/7 construction is proposed for the tunnel, that general construction activities are proposed for Monday to Sunday 6:30am to 9:00pm, and that other activities might extend beyond those general hours where required for safety and / or traffic management reasons.
47. There is the potential that works outside Monday to Saturday 7:30am to 6:00pm will exceed the construction noise limits. However, a large proportion of the proposed route has significant setbacks to the nearest receivers and topographical shielding, which will enable compliance with the night-time noise limits.
48. If night works are required within 400m of a dwelling, occupants should be advised at least five days prior to the works occurring. Night works in excess⁸ of the noise limits should not occur for more than 5 consecutive nights, and an acoustic engineer should be involved in scheduling of noisy works and monitoring to ensure BPO is adopted.
49. The southern spoil disposal site adjacent 2397 Mokau Road should only operate Monday to Saturday 7:30am to 6:00pm if the house is not occupied and / or leased by the Project.
50. It is predicted that construction noise can generally comply with the Monday to Saturday day-time limits at all dwellings, with the exception of 2397 Mokau Road, which may require a noise barrier or on-site management to enable compliance. A procedure to determine compliance and mitigation measures, if required, is provided in the CNMP.

⁸ The CNMP provides setback distances for the anticipated equipment to assist with determining compliance.

51. With good noise mitigation and management procedures via the CNMP, I consider the construction noise effects will be acceptable.

Construction vibration

52. It is predicted that both the avoidance of building damage and human amenity vibration criteria can be readily complied with due to the large setback distances of buildings to the construction site. I consider the construction vibration effects acceptable.

ADDRESSING POTENTIAL EFFECTS

53. The potential noise and vibration effects of the Project on PPFs are addressed in the proposed conditions, and in the CNMP.
54. I have reviewed the proposed conditions and consider them appropriate.
55. A CNMP has been developed to address potential adverse effects from construction noise. A draft of the CNMP was submitted as part of the application. A further (final) draft is attached to the evidence of Mr Roan. That further drafts incorporates the recommendations and measures set out in the previous section of my evidence. I understand that the intention is that the CNMP which will be implemented throughout the Project.
56. The CNMP provides a framework so that the construction team can minimise construction noise effects by:
- (a) providing best practice noise mitigation and management procedures;
 - (b) providing guidance as to when construction activities are at risk of exceeding the relevant noise limits;
 - (c) recommending noise mitigation options to enable compliance where practicable; and
 - (d) where compliance is not practicable, providing a framework for the contractor to:
 - (i) develop the best practical option for mitigation;
 - (ii) communicate with the affected parties; and
 - (iii) monitor exceedances.
57. A review of the CNMP will be undertaken at least annually to ensure it remains appropriate, and is responsive to any issues arising during construction.

RESPONSE TO SUBMISSIONS AND SECTION 42A REPORT ON NOISE AND VIBRATION ISSUES

58. I respond below to noise and vibration issues raised in submissions on the Project and in the Section 42A Reports on the Project.

Submissions

59. I am not aware of any submissions that raise noise issues other than in general and nonspecific ways.

Section 42A Reports

60. I have read the Section 42A report by the New Plymouth District Council ("NPDC") reporting officer (Rachelle McBeth). That report has relied upon information provided to her by Acousafe (Nigel Lloyd) who has provided an acoustic review for NPDC.

Operational noise

61. With regard to operational noise of the realigned State Highway, Mr Lloyd does not disagree with predicted noise levels and concludes, as do I, that actual traffic noise will not exceed 54dB $L_{Aeq(24 \text{ hours})}$ which will provide acceptable noise levels even with windows open.
62. Therefore, I understand that Mr Lloyd and NPDC agree that operational noise levels will be acceptable.

Construction noise

63. With regard to the construction phase of the Project, the only matters of concern relate to 3072 Mokau Rd and the potential noise from the spoil area near 2397 Mokau Rd.
64. I understand the Pascoe house at 3072 Mokau Rd will be vacant during the construction operation and therefore consideration of noise at that unoccupied house is not required.
65. The reporting officer has accepted the findings of the Noise and Vibration Assessment and adopted the recommended reduced hours of operation for the spoil area. The reporting officer has suggested that in addition to the offered hours and days of operation of the spoil area that this be extended to include public holidays. It has been confirmed to me that the Transport Agency agrees to this measure which I also agree is sensible.
66. The occupancy of 2397 Mokau Rd during the construction phase is not known at this time, and that the house may be occupied and / or leased by the Project. With that in mind, I recommend the offered and agreed to limits on hours and days of operation of the spoil area only apply if the house is not

occupied by persons working on the Project, or written approval to operate outside those hours has not been secured.

Damian Ellerton

25 May 2018