

Before a Board of Inquiry
MacKays to Peka Peka Expressway Proposal

under: the Resource Management Act 1991

in the matter of: Notice of requirement for designation and resource consent applications by the NZ Transport Agency for the MacKays to Peka Peka Expressway Proposal

applicant: **NZ Transport Agency**
Requiring Authority

Statement of evidence of **Siiri Wilkenig** (Operational Noise) for the NZ Transport Agency

Dated: 4 September 2012

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STATEMENT OF EVIDENCE OF SIIRI WILKENING FOR THE NZ TRANSPORT AGENCY

QUALIFICATIONS AND EXPERIENCE

- 1 My full name is Siiri Wilkening.
- 2 I am an acoustical consultant employed by Marshall Day Acoustics Ltd (*MDA*). I have had more than fifteen years experience in acoustic engineering in Germany and New Zealand, specialising in environmental noise control and computer noise modelling. I hold a Masters degree in Environmental Engineering (Land Improvement and Environmental Protection) from the University of Rostock, Germany. I am a Member of the Acoustical Society of New Zealand.
- 3 Over the last fourteen years I have been involved in investigating and reporting on traffic noise effects of numerous roading projects, including local roads and State highways (*SH*). My work has involved all aspects of traffic noise assessments, from route selection and evaluation, through noise level surveys, computer noise modelling, reporting, community consultation and consenting.
- 4 I have given evidence at Council planning hearings and before a Board of Inquiry (*BoI*), and have taken part in Environment Court mediations. Roding projects I have been involved with include the following:
 - 4.1 Victoria Park Tunnel;
 - 4.2 Newmarket Viaduct Improvement Project;
 - 4.3 Waterview Connection Project;
 - 4.4 SH16/18 Realignment;
 - 4.5 SH1 Northern Motorway Extension Orewa to Puhoi;
 - 4.6 SH22 Drury Widening;
 - 4.7 North Shore Busway;
 - 4.8 SH20 to SH1 Manukau Link;
 - 4.9 SH20 Manukau Harbour Crossing;
 - 4.10 SH1 Improvement Projects Warkworth;
 - 4.11 East Taupo Arterial Road; and
 - 4.12 Additional Waitemata Harbour Crossing.

- 5 My evidence is given in support of the Notice of Requirement (*NoR*) and applications for resource consents lodged with the Environmental Protection Authority (*EPA*) by the NZ Transport Agency (*the NZTA*) for the construction, operation and maintenance of the MacKays to Peka Peka Expressway (*the Project*).
- 6 I am familiar with the area that the Project covers and the State highway and local roading network in the vicinity of the Project.
- 7 I am the author of the Assessment of Traffic Noise Effects Technical Report, and I reviewed the Pre-Construction Noise Level Survey, which was prepared for me by Mr Bill Wood, a colleague and consultant at MDA.¹ These reports formed part of the Assessment of Environmental Effects (*AEE*) lodged in support of the Project.
- 8 My evidence provides an overview of traffic noise matters, based on Technical Report No. 15 "Assessment of Traffic Noise Effects" (*Technical Report 15*). That report should be referred to for more technical and detailed information relating to the assessment of traffic noise.
- 9 I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Consolidated Practice Note (2011), and I agree to comply with it as if this Inquiry were before the Environment Court. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

- 10 My evidence will deal with the following:
- 10.1 Executive Summary;
 - 10.2 Background and Role;
 - 10.3 Existing Noise Environment;
 - 10.4 Methodology used for Traffic Noise Assessment;
 - 10.5 Traffic Noise Assessment– both application of the relevant New Zealand Standard and assessment of the impact of the predicted changes in noise levels as a result of the Project;
 - 10.6 Response to Submissions;

¹ Technical Reports 15 and 17 respectively (Volume 3 of the lodged documentation).

10.7 Response to Section 149G Key issues reports;

10.8 Proposed Conditions; and

10.9 Conclusions.

EXECUTIVE SUMMARY

- 11 My colleagues at MDA and I have provided input into the Project route selection process and initial design determinations, resulting in a partial avoidance² and mitigation³ of noise effects from the outset.
- 12 My colleagues at MDA have undertaken measurements to establish the existing ambient noise levels in the Project areas.⁴ I have undertaken modelling to predict future noise levels from traffic on the proposed Expressway without mitigation.⁵ I then developed several mitigation options, all of which would achieve acceptable, but varying, degrees of noise level reduction, which I provided to the wider Project technical team. The team, with my input, selected the mitigation options that were considered to constitute the best practicable option (*BPO*) to mitigate noise effects, in a manner that avoided giving rise to other technical or engineering concerns.
- 13 I have assessed the Project's traffic noise effects in accordance with the New Zealand Standard NZS 6806:2010 Acoustics – Road-traffic noise – New and altered roads (*the Standard*) and in relation to human response to noise level changes.
- 14 I consider that the implementation of the Project would result in a significant increase in noise levels above existing ambient noise levels for most areas.⁶ This is due to the current noise environment being low, as would be expected in an area generally unaffected by other noise sources. However, with the implementation of the selected mitigation options, external noise levels can be achieved that I consider are appropriate for areas used for residential

² Examples are the preference of the eastern route at Poplar Avenue thus avoiding noise effects on Raumati South School and Te Ra School; and preference of the western route at Te Moana Road thus avoiding noise effects on some of the dwellings in the Te Moana, Kauri and Puriri Road area.

³ For example the choice of Open Graded Porous Asphalt (*OGPA*) on Sectors 1 to 3 where a large number of residents are located in close proximity to the Expressway. Generally, *OGPA* would be considered a mitigation measure and applied as such, rather than being chosen from a project's outset, as has been the case with this Project. This is further discussed in paragraph 54 below.

⁴ Refer Technical Report 17 (Pre-Construction Noise Level Survey) for results.

⁵ This modelling assumes that low noise generating road surface material (i.e. *OGPA*) would be used on the sections of the Project from its southern end to just north of Te Moana Road, but without any other specific noise mitigation measures being in place.

⁶ Except at the northern and southern connection with the existing SH1, and where the Expressway crosses major local roads.

activities, while providing an appropriate balance between noise level reduction and other factors, such as the visual, cost and urban design implications of noise mitigation measures.

- 15 For areas where the Project connects with the existing SH1 and crosses major local roads, I predict that noise levels would remain similar to current levels due to the mitigation proposed along the Expressway. I consider that the traffic noise effects of the Project would generally be insignificant to minor for these areas.
- 16 Finally, I have read the submissions lodged on the Project which raise traffic noise issues. Nothing raised in those submissions causes me to depart from the conclusions reached in Technical Reports 15 and 17.

BACKGROUND AND ROLE

- 17 The NZTA retained MDA as part of a consortia team to assist with the investigation, design and planning of the Project. Amongst other things, I was asked to prepare an Assessment of Traffic Noise Effects in relation to the traffic noise effects of the Project. My Report was lodged with the EPA on 20 April 2012 as part of the Project's AEE (Volume 3, Technical Report 15).
- 18 My input to the Project involved the evaluation of noise effects of various route selection options and their ranking, supervision of ambient noise level surveys, computer noise modelling of future traffic noise levels, input into the determination of the selected noise mitigation options, and assessment of noise effects of the Project with the selected mitigation options. In addition, I attended, and contributed to, several public open days and had discussions with individual residents and affected parties.
- 19 The effects of construction noise require separate consideration from the effects of traffic noise. I prepared a separate assessment of the construction noise effects of the Project (Technical Report 16) and have also prepared a separate brief of evidence on such effects.
- 20 Construction and operational vibration effects of the Project also require separate consideration and have been assessed and reported on by **Mr James Whitlock** of MDA. That report was also lodged with the EPA as part of the AEE (Volume 3, Technical Report 18).

EXISTING NOISE ENVIRONMENT

- 21 The Project generally consists of a new road that will traverse an undeveloped corridor through a variety of existing land uses ranging from green field to suburban sites. I therefore chose to determine the existing ambient noise environment through noise level surveys,

rather than computer noise modelling. In my opinion, it is not feasible to obtain accurate and realistic computer modelling results for such a base situation because for a large extent of the Expressway alignment, noise levels are not controlled by specific sources (e.g. traffic or industry) but rather by natural sounds that vary depending on season, weather and location and cannot therefore be generalised.

- 22 The existing noise environment is described in detail in Technical Report 17 and is summarised in Technical Report 15.⁷ Generally, for locations distant from existing local roads and SH1, ambient noise levels are low, between 42 and 50 dB $L_{Aeq(24h)}$. Noise levels in areas close to major roads, e.g. Kāpiti Road and SH1, are elevated and were measured to be up to 70 dB L_{Aeq} .
- 23 The introduction of any new noise sources, in this instance traffic on the new Expressway, would lead to a considerable increase in noise level in most areas in the vicinity of the Project. This is mainly due to the fact that the existing ambient noise levels are so low. Most of the Project will traverse environments with noise levels that are well below those normally experienced with residential use. Additionally, I observe that the proposed road will have relatively low traffic volumes of 12,000 to 21,000 vehicles per day.⁸ Therefore, with the Project in place, the noise levels received at residential properties in the vicinity will not be unusual for properties in the vicinity of a road in the Kāpiti Coast District.

METHODOLOGY USED FOR TRAFFIC NOISE ASSESSMENT

- 24 The methodology of my assessment of traffic noise effects (and the involvement of various members of the Project team at relevant times) is shown in two flow charts attached as **Annexure A** of my evidence. This assessment methodology is described in detail in Technical Report 15.⁹
- 25 The discussion below uses the term "assessment position". This is a position at a building being assessed, which is located on the exterior wall of that building that would be most affected by noise from a proposed roading project, determined in accordance with the Standard.

⁷ Technical Report 15, Section 4.2 'Summary of existing noise environments'.

⁸ For comparison, NZTA traffic counts show that in 2011 SH1 carried 24,316 vehicles per day at QEII Park and 24,316 vehicles per day north of Ihakara St in Paraparaumu (<http://www.nzta.govt.nz/resources/state-highway-traffic-volumes/>).

⁹ Technical Report 15, Section 5.1 'New Zealand Standard NZS6806:2010'.

- 26 In summary, the assessment involves the following steps (for each assessment position):¹⁰
- 26.1 I determined the existing noise environment of representative positions in the vicinity of the Expressway. This was done through extensive noise level surveys rather than computer modelling.¹¹ From the survey results, I derived the existing noise levels for all assessment positions.
 - 26.2 I modelled the proposed alignment of the Expressway and predicted noise levels with the Project, but without any noise mitigation measures in place (but including OGPA in Sectors 1 to 3)¹² – the ‘Do-minimum scenario’.¹³
 - 26.3 I developed several noise mitigation options for each individual noise receiving environment all of which, in my opinion, achieved suitable noise outcomes for the assessment positions. I then provided these mitigation options to the wider Project team for analysis; and members of the Project team provided feedback relating to their area of expertise (e.g. urban design, safety, engineering etc). All feedback was compiled in matrix form.¹⁴
 - 26.4 Mitigation options and their implications relating to all relevant Project disciplines were discussed at a workshop, and for each noise receiving environment a mitigation option was selected (referred to as the ‘Selected Mitigation Option’), that achieved suitable outcomes in relation to noise while avoiding, as far as practicable, other effects.
 - 26.5 I recalculated the noise levels using the selected mitigation options for the entire alignment, which form the ‘Selected Mitigation Options’ for the Project.¹⁵ These are the mitigation options which are proposed to the BoI, for each Sector.
- 27 I consider that this methodology is appropriate in assessing the noise effects from the Project in a Resource Management Act 1991 (RMA) context. It allows the examination of several alternative mitigation options and their respective effects, and the determination of practicability (by means of input from other Project disciplines through the matrix and workshop) of these mitigation

¹⁰ My assessment has been undertaken in accordance with the Standard.

¹¹ Technical Report 15, Section 4 ‘Existing noise environment’ and paragraph 21 above.

¹² Refer paragraph 54 below.

¹³ Technical Report 15, Section 5.1.3 ‘Noise assessment scenarios’.

¹⁴ Technical Report 15, Appendix C.

¹⁵ Technical Report 15, Appendix B.

measures. Resulting noise levels (i.e. those arising with the Selected Mitigation Options in place) have then be assessed against base line noise levels (e.g. the existing noise environment) to determine the effects of the Project on affected people.

Road Traffic Noise Standard

- 28 The assessment methodology I used is based on the Standard. The Standard is a full New Zealand Standard developed by a committee of independent experts. Prior to the development of the Standard, the NZTA (and its predecessors) used the NZTA developed 'Guidelines for the Management of Road Traffic Noise – State Highway Improvements' (1999) (*Guidelines*).
- 29 I note that the Kāpiti Coast District Plan (*the District Plan*) contains traffic noise rules for new roads carrying more than 5,000 vehicles per day. These rules are a reproduction of the Guidelines. The Guidelines were an NZTA internal document which was developed in the absence of any other traffic noise criteria in New Zealand.¹⁶ I note that the District Plan is currently being reviewed, and I anticipate that road traffic noise rules are likely to be updated to take into account the development of the relevant New Zealand Standard.¹⁷
- 30 As I have set out earlier, part of the Standard's methodology involves identification of the noise effects of a project without any specific noise mitigation (called the "Do-minimum scenario" in the Standard). The methodology then focuses on the determination of appropriate noise mitigation (where necessary), with such mitigation considered to constitute the BPO through input from all relevant Project disciplines (for example, urban design, ecology, and engineering). The involvement of the wider Project team provides for timely discussion and early consideration of noise mitigation and appropriate balancing of aspects as required under the RMA. This ensures that proposed mitigation measures are practicable and achievable and do not create unintended adverse effects (e.g. visual).
- 31 The approach to noise mitigation set out in the Standard is different to other New Zealand noise standards. Rather than specifying a numerical noise limit which must be complied with, the Standard sets up a hierarchy of noise criteria which the Project team should aim to achieve if that is consistent with the BPO. The Standard

¹⁶ I note that, for completeness, during the development of the mitigation options for each assessment area, one of these mitigation options always fulfils the requirements of the Guidelines. This option is marked in the spreadsheets (in Appendix C to Technical Report 15) and is also discussed in Technical Report 15, throughout Sections 7.3 to 7.6. I also note that as this Project is being undertaken pursuant to a designation, the rules in the District Plan in relation to traffic noise do not apply.

¹⁷ Technical Report 15, Section 5.4 'District Plan'.

requires the Project team to collaboratively agree on the best practicable mitigation option for certain noise sensitive locations (referred to as "protected premises and facilities" or PPFs) for any given noise receiving environment adjacent to a road. The resulting mitigation options for the Project – i.e. "the selected mitigation options" – are put forward as the proposed design solution of the Project team as lodged with the Project application.

- 32 Of course, it remains open to the BoI to favour other options which also adequately mitigate noise and these are set out in Technical Report 15.¹⁸ However, while alternative mitigation options would also achieve an acceptable noise outcome, I note that other effects may arise from implementing those options that may have led to that particular mitigation option being discounted by the Project team during the feedback and workshop process.
- 33 As noted above, this process does not require absolute noise limits to be met. Instead it determines which noise criteria category¹⁹ would apply to each dwelling assessed following the implementation of the selected mitigation option. Unlike the Guidelines, the Standard's noise criteria are not based on allowable increase in noise over and above the existing ambient noise levels. Instead, they are stated as absolute noise criteria which the committee developing the standard considered to be reasonable noise levels *"taking into account health issues associated with noise, the effects of relative changes in noise levels on people and communities, and the potential benefits of new and altered roads to people and communities"*.²⁰

¹⁸ Technical Report 15, Appendix C.

¹⁹ Technical Report 15, Section 5.1.2 'Noise criteria'.

²⁰ Section 1.1.4 of the Standard.

- 34 Which set of criteria in the Standard applies to a Project is dependent on the predicted future traffic volume once the Project is implemented and whether the Project consists of a new or altered road. The noise criteria have three levels, as follows:²¹

Category	Altered Roads	New Roads with a predicted traffic volume of 2,000 to 75,000 AADT ²² at the design year
	dB L _{Aeq(24h)}	dB L _{Aeq(24h)}
A (primary external noise criterion)	64	57
B (secondary external noise criterion)	67	64
C (internal noise criterion)	40	40

- 35 The fundamental basis of compliance with the Standard is the application of the BPO to achieve one of three noise criteria categories (A, B and C). The criteria are applied progressively, i.e. with criterion B being met or bettered if criterion A is not practicably achievable, and so on.
- 36 Where it is not consistent with the BPO to achieve either the Category A or Category B external noise criteria, and where, with the implementation of practicable structural noise mitigation, the internal noise levels of any habitable space²³ in a PPF would be greater than 45 dB L_{Aeq(24h)}, the Standard requires a Project team to

²¹ Only those criteria relevant to the Project are set out. For a full table, refer to the Standard, Section 6.1.2, Table 2.

²² AADT means "annual average daily traffic", i.e. the daily traffic flow averaged over a year.

²³ Standard, 2.2 Definitions: "A space used for activities normally associated with domestic living, but excluding any garage, bathroom, laundry, toilet (water closet), pantry, walk-in wardrobe, corridor, hallway, lobby, clothes-drying room, or other space of a specialised nature occupied neither frequently nor for extended periods." This definition mirrors that of the New Zealand Buildings Code.

seek to achieve an internal noise level in such spaces of 40 dB $L_{Aeq(24h)}$ (which is Category C).

- 37 This process can sometimes be seen as providing an uncertain outcome for residents. I disagree with this view for the following reason.
- 38 A single numerical noise limit (as previously prescribed by the Guidelines) is often difficult to describe in a manner easily understood by lay people. By comparison, rather than requiring a Project team to come up with a number, the Standard requires the team to come up with a specific selected mitigation option which consists of physical measures such as, for example, acoustic barriers of specific heights, lengths and locations, or road surface materials in specified locations. The imposition of designation conditions which require the road controlling authority to both:
- 38.1 Implement those specific measures, and
- 38.2 Undertake post construction investigations to confirm that those measures actually achieve the predicted noise criteria category for each dwelling,

in my opinion, provides a comprehensible and assured outcome for residents.

Application of the noise criteria in the Standard to the Project

- 39 The noise criteria categories of the Standard (Categories A, B and C) form part of the framework of the assessment. For this Project, no dwelling would fall into the "back stop" Category C, where the focus is on internal noise levels and which applies only in circumstances where the external noise levels cannot practicably be reduced sufficiently.²⁴
- 40 With the selected noise mitigation options, the majority of dwellings affected by the Project (296 out of 329) would be within Category A with external noise levels at or below 57 or 64 dB $L_{Aeq(24h)}$, for PPFs next to new and altered roads respectively.
- 41 For the remaining dwellings which are predicted to have noise levels exceeding Category A:
- 41.1 The remaining dwellings that are located adjacent to new road sections are predicted to have external noise levels of between 58 and 63 dB $L_{Aeq(24h)}$ (i.e. they will fall within Category B for a new road); and

²⁴ The methodology of how the noise categories are determined for each assessment position is shown in the second flow diagram in **Annexure A**.

41.2 The remaining dwellings that are located adjacent to altered road sections in the vicinity of SH1, are predicted to have external noise levels of between 64 and 67 dB $L_{Aeq(24h)}$ (i.e. they will fall within Category B for an altered road).

42 This means that all dwellings affected by the Project will achieve either Category A or Category B external noise levels (with the selected mitigation).

Internal Noise Levels

43 The Standard provides for a “back stop” internal noise criterion if practicable structural (i.e. external) noise mitigation measures (e.g. noise barriers/OGPA) cannot achieve acceptable external noise levels. I consider that focusing on internal noise levels only is not desirable as it leaves the external environment (such as outdoor BBQ areas) unprotected. The Standard takes account of this by acknowledging that the internal noise criterion should only be applied once all practicable external mitigation measures have been explored.²⁵

44 If it is not practicable to achieve the Category A or B external noise criteria and predicted internal noise levels are in excess of 45 dB $L_{Aeq(24h)}$, the Standard requires that any building modification achieve a noise level reduction of at least 5 decibels, (i.e. to a level of 40 dB $L_{Aeq(24h)}$). This is because if the effort is going to be made to put building modification in place, it makes sense to require that building modification mitigation to achieve a noticeable noise reduction.

45 The internal noise criterion trigger level of 45 dB $L_{Aeq(24h)}$ relates to recommended internal design sound levels set out in the nationally accepted AS/NZS2107:2000,²⁶ which provides ranges of sound levels for various internal spaces within buildings, including habitable rooms adjacent to roads.

46 Because of the variation in noise level over a 24 hour period, an internal noise level of 45 dB $L_{Aeq(24h)}$ is an appropriate trigger level as it would result in internal night-time noise levels of between 35 and 40 dB $L_{Aeq(24h)}$, which is within the range given in AS/NZS2107:2000, while allowing for reasonable external noise levels.

47 The following graph (**Figure 1**) shows the average diurnal variation of noise levels for one of the noise survey locations:²⁷

²⁵ NZS 6806:2010, Sections 8.3.1 and 8.3.4.

²⁶ AS/NZS2107:2000 “Acoustics – Recommended design sound levels and reverberation times for building interiors”.

²⁷ Technical Report 17, Appendix 17D, LT3 100 Kāpiti Road external noise level.

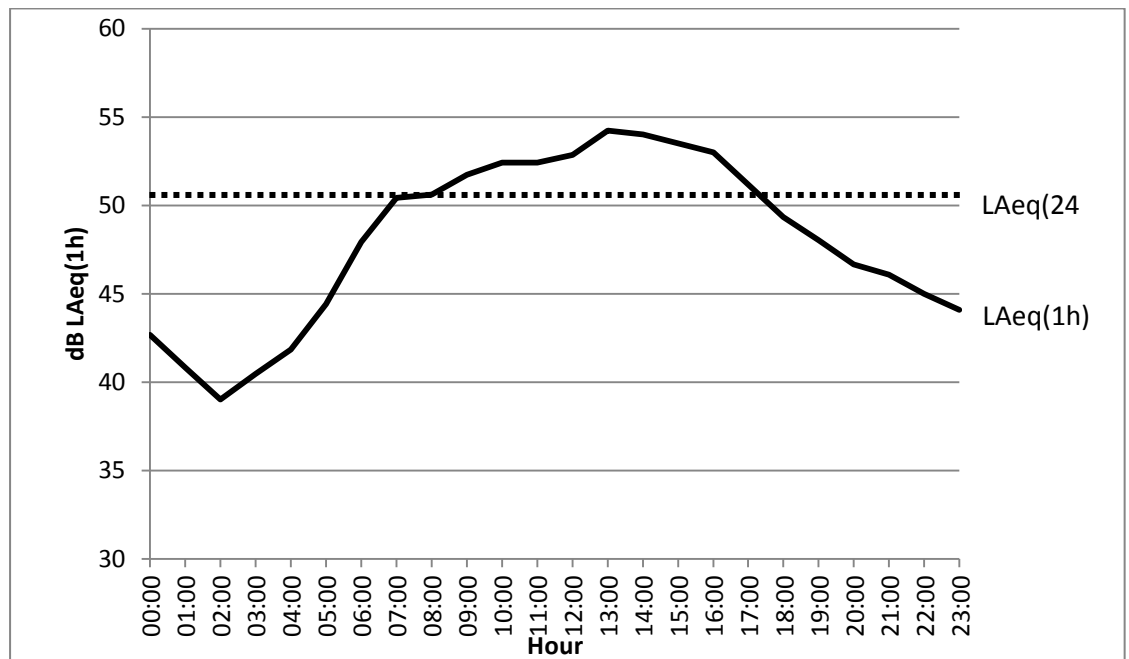


Figure 1 – Average diurnal variation in noise levels

- 48 As can be seen from the graph, an internal daily average noise level of 45 dB $L_{Aeq(24h)}$ would result in less noise (by between 5 and 10 decibels) being received during night-time and slightly more (up to 4 decibels, and generally around 2 decibels) during daytime. This is due to the variation in traffic volume over a 24 hour period, with busiest times during the morning and afternoon peak, which drops off only slightly during the day. At night, despite a potential increase in the percentage of heavy vehicle numbers, the overall traffic volume would be considerably lower, thus resulting in an overall lower noise level.
- 49 Based on common construction materials for New Zealand dwellings,²⁸ with the proposed external noise mitigation measures in place, all Category A and Category B dwellings assessed for this Project are predicted to generally receive internal noise levels of 45 dB $L_{Aeq(24h)}$ or less, as required by the Standard. As a result no building modification mitigation would be required to achieve that internal noise level.²⁹

²⁸ Research has shown that New Zealand dwellings achieve traffic noise level reductions of between 20 and 25 decibels with external windows and doors closed. There is variation depending on the age, quality and combination of building structures (e.g. timber joinery versus aluminium joinery), however, without a dwelling-by-dwelling inspection it is not possible to state if any of the assessed dwellings would have a lesser performance.

²⁹ Of all dwellings assessed, assuming a noise level reduction of at least 20 decibels, only one dwelling may receive an internal noise level of more than 45 dB $L_{Aeq(24h)}$, namely 9 Te Kowhai Road. This dwelling, while included in the

TRAFFIC NOISE ASSESSMENT

50 In this section of my evidence I will briefly describe the key points of the assessment of traffic noise effects. The full assessment is contained in Section 7 of Technical Report 15.

51 My assessment is composed of two parts:

51.1 An assessment in accordance with the Standard; and

51.2 An assessment of effects, based on the predicted noise level change at affected dwellings and the appropriateness of the resultant noise level in relation to residential use.

I discuss both below.

Application of the Standard

52 I have undertaken a detailed assessment of traffic noise effects of PPFs within 100 metres of the Project³⁰ with extensive input from the wider Project team as required by the Standard. This resulted in the development and refinement of mitigation options, and the determination of selected mitigation options³¹ proposed by myself and the Project team to constitute the BPO. The options assessed are presented in Section 7 and in Appendix C of Technical Report 15. As noted above, the process followed is depicted in the flow charts in **Annexure A** of my evidence.

53 The proposed noise mitigation measures consist of low noise generating road surface material (OGPA) or barriers (noise walls or bunds), or a combination of the two. My assessment indicates that with this mitigation in place, no dwelling would require building modification mitigation (such as additional insulation) in order to achieve appropriate internal noise levels (i.e. no building would fall into Category C, as defined by the Standard).

54 For Sectors 1 to 3 (refer paragraphs 62 to 77 below) where the Project traverses moderately populated areas, the use of OGPA was proposed by the Project team from the outset.³² I consider that

assessment, is inside the designation and would therefore be under the control of the NZTA (e.g. it may not be retained for residential use).

³⁰ In accordance with the Standard, for areas defined as "urban" by Statistics New Zealand, the assessment area extends 100 metres from the edge of the new or altered road. The Kāpiti area (which the Project traverses) is defined as a Main Urban Area by Statistics New Zealand.

³¹ Technical Report 15, Appendix B.

³² At the time of the assessment I understood that the base choice of OGPA for Sectors 1 to 3 was for reasons other than noise (refer Technical Report 15, Section 6.2.2 'Road surface material'). However, further discussion with the Project team showed that noise mitigation for Sectors 1 to 3 was one of the reasons why the team chose a low-noise generating road surface material for those Sections.

OGPA is the most effective road traffic noise mitigation measure as it reduces noise directly at the source (i.e. car tyres interacting with the road surface) and benefits the widest possible surrounding area. This means that in Sectors 1 to 3, unusually, OGPA has been assessed as part of the "Do-minimum" scenario. My "Do-minimum" assessment also took into account the proposed presence of concrete road safety barriers where appropriate (which also can reduce noise).

- 55 As a result of this "default" inclusion of OGPA and safety barriers, no further noise mitigation is required for some of the noise receiving environments leading to the adoption of the "Do-minimum" scenario as the selected mitigation option for those areas. In my opinion, the extensive use of OGPA is a positive outcome for the Project.³³
- 56 I consider that (other than my assuming the presence of OGPA in Sectors 1 and 3 in my "Do-minimum" assessment as discussed above) the methodology of the Standard has been applied consistently throughout my assessment and that the selected mitigation options, which have been chosen from a number of mitigation options, all of which achieve appropriate noise outcomes, are practicable. These selected mitigation options achieve appropriate, albeit varying, noise level reductions and address other considerations, such as urban design, safety, cost and shading effects of noise mitigation measures, as required under the BPO approach.

Assessment of the impact of the changes in noise levels

- 57 In my opinion, compliance with any New Zealand acoustic standard does not necessarily mean that the effects of a project will be minor or reasonable in the circumstances under consideration. In order to take account of this, in addition to an assessment of mitigation options in relation to the Standard noise criteria categories, I have also assessed the noise effects at dwellings due to the predicted change in noise levels as a result of the Project. This was done by comparing the existing noise environment with the future noise environment, with the Expressway and the selected mitigation in place.³⁴
- 58 As set out earlier in my evidence, the introduction of a new noise source into a low noise environment would typically be perceived as a significant change, and this is acknowledged throughout my assessment (Technical Report 15).³⁵

³³ Later in my evidence, I address mitigation options in Sector 4 and why the use of OGPA is not recommended throughout that Sector as part of the construction of the Project.

³⁴ Technical Report 15, Section 7 'Assessment of traffic noise levels'.

³⁵ Technical Report 15, Sections 7.3 to 7.6, generally under the subheading "Assessment of effects".

- 59 In my opinion, predicted future noise levels from the Project (with the selected mitigation options in place) are within a range that I consider is appropriate for residential use, and which are experienced widely across New Zealand in a residential context, without causing adverse effects to residents.
- 60 The conclusion of my effects assessment is that the effects from changes in the noise environment due to the Project's implementation range from negligible to significant. However, in my opinion, the resulting noise levels would be appropriate and reasonable for the current activities adjacent to the Project. It is rather that, in the same way that introducing an arterial road in the vicinity of a dwelling changes the nature of the visual environment in which that dwelling is located, the Project will change the nature of the noise environment in which some dwellings are located. This does not of itself mean that the changed noise environment is unreasonable or unacceptable, and in my view it will not be.

Traffic noise assessment of the Project by sector

- 61 The Project has been divided into four sectors. For the traffic noise assessment, I further subdivided each sector into assessment areas.³⁶ These areas relate to dwellings or groups of dwellings which are likely to benefit from a specific noise mitigation measure (e.g. a barrier). I summarise the traffic noise effects for each sector, and assessment area, below.

Sector 1

- 62 Sector 1 extends from the southern connection of the Project at Poplar Avenue to north of Raumati Road. I subdivided the sector into three assessment areas with a total of 44 assessment positions.³⁷
- 63 Where the Project is in close proximity to the existing SH1, between Poplar Avenue and north of Leinster Avenue, I have assessed the road as an 'altered road' for the purposes of the Standard.³⁸ This is due to the fact that dwellings in the area are already affected by traffic noise from SH1. I have predicted that dwellings in this area, with the proposed mitigation, would generally receive noise levels similar to or slightly higher than existing noise levels, and that therefore effects would generally be minor.

³⁶ Technical Report 15, Section 7.2 'Receiving environments'.

³⁷ Technical Report 15, Section 7.3 'Sector 1 – MacKays Crossing to Raumati Road'.

³⁸ Technical Report 15, Section 5.1.2 'Noise criteria'.

- 64 Mitigation selected in this area consists of the (pre-determined) use of OGPA and a 2 metre high bund between dwellings in the vicinity of Leinster Avenue and the Expressway.³⁹
- 65 At the northern end of Sector 1, south of Raumati Road, dwellings are currently in a low noise environment. Mitigation selected includes the use of OGPA and the installation of a 2 metre high bund along the eastern side of the Expressway. I predict that the introduction of the Expressway into this area (with the selected mitigation in place) would result in a significant increase in noise level, of up to 15 decibels.⁴⁰
- 66 However, all dwellings in this assessment area (except for three) would receive external noise levels at or below 57 dB $L_{Aeq(24h)}$ ⁴¹ which means that external and internal noise levels would be of a good standard for residential use. The three exceptions are dwellings adjacent to Raumati Road, which are predicted to receive noise levels between 57 and 62 dB $L_{Aeq(24h)}$ ⁴² which I consider to still be appropriate noise levels for residential use and resulting in appropriate internal noise levels also.

Sector 2

- 67 Sector 2 extends from north of Raumati Road to north of Mazengarb Road. This sector includes the highest population density closest to the Expressway. Sector 2 consisted of five individual assessment areas contained a total of 232 PPFs within 100 metres of the Project. In Sector 2, the Expressway would constitute a 'new road' in accordance with the Standard.⁴³ I have also assessed the Expressway against the 'new road' criteria (which set lower noise criteria than for an 'altered road') where it crosses local roads such as Kāpiti or Mazengarb Roads, even though under the Standard these areas could be assessed as 'altered roads'.
- 68 Mitigation selected by the Project team includes the use of the (pre-determined) OGPA and noise barriers where appropriate. Barriers and bunds at varying heights are proposed north of Raumati Road and, on both sides of the Project, north and south of Kāpiti Road.
- 69 My assessment focussed extensively on the residential areas south of Kāpiti Road and between Kāpiti and Mazengarb Roads, due to the large number of residences in close proximity to the Expressway in

³⁹ Technical Report 15, Section 7.3.1 'West of proposed Expressway – Leinster Avenue area'.

⁴⁰ Technical Report 15, Section 7.3.2f 'West of proposed Expressway – Raumati South area'.

⁴¹ Category A is defined as noise levels up to and including 57 dB $L_{Aeq(24h)}$.

⁴² Category B is defined as noise levels from 58 and to 64 dB $L_{Aeq(24h)}$.

⁴³ Technical Report 15, Section 5.1.2 'Noise criteria'.

those areas.⁴⁴ Several noise mitigation options were discussed amongst the Project team, with considerable balancing of noise and urban design effects required. The challenge was to achieve effective noise level reductions without causing other adverse effects, such as areas which compromise personal safety and security⁴⁵ or shading of residential properties.⁴⁶ Therefore, the selected mitigation option involves the reshaping and extension of existing dunes between the Expressway and residential sites, which allows the height of the noise mitigation to be absorbed in a sympathetic form appropriate for and in keeping with the surrounding area.⁴⁷

- 70 As discussed previously, the introduction of the Expressway into this currently relatively quiet suburban area would for many receivers (121 of the 232) result in significant increases in noise level of more than 9 decibels.
- 71 Notwithstanding this, external noise levels for 217 dwellings would be 57 dB $L_{Aeq(24h)}$ or less, and for another 13 dwellings, levels of 58 to 59 dB $L_{Aeq(24h)}$. Only two dwellings are predicted to receive higher noise levels of 62 and 63dB $L_{Aeq(24h)}$ ⁴⁸ but this is still within Category B of the Standard. Overall, these noise levels are appropriate for residential use and would also result in a good standard for internal noise levels, as set out earlier in my evidence.
- 72 Given the close proximity of dwellings to the Project, the selected mitigation options would in my opinion achieve significant noise level reductions while avoiding the introduction of other adverse effects on these dwellings.

Sector 3

- 73 Sector 3 extends from north of Mazengarb Road to north of Te Moana Road. This sector is predominantly rural in character, with intermittent settlements around local roads, such as Mazengarb, Otaihanga, Kauri, Puriri and Te Moana Roads. The low residential density resulted in the subdivision of this sector into six

⁴⁴ Technical Report 15, Section 7.4.4 'East of proposed Expressway – Kāpiti Road to Mazengarb Road area'.

⁴⁵ For instance, particular care had to be taken in designing noise mitigation measures in the area where the cycle way and footpath south of Kāpiti Road would traverse between the property boundary fence and the Expressway noise fence.

⁴⁶ For instance, where high barriers up to 5 metres are required to the west of the properties between Kāpiti and Mazengarb Roads.

⁴⁷ Refer Evidence in Chief of **Mr Marc Baily** (Urban Planning).

⁴⁸ 22 Chilton Drive and 21 Observation Place respectively. Both dwellings are double storey and elevated above the Expressway. The proposed barriers result in noise level reductions at the ground floor but are less effective at the second floor.

individual assessment areas with a total of only 43 assessment positions.⁴⁹

- 74 In addition to the use of OGPA, the mitigation selected for Sector 3 includes barriers of between 2 and 3 metres in height.⁵⁰ The selected mitigation option for the areas surrounding Te Moana Road also includes the use of OGPA on Te Moana Road in the vicinity of dwellings.⁵¹
- 75 Most dwellings⁵² would receive noise levels of 57 dB $L_{Aeq(24h)}$ or less. The exception are nine dwellings fronting Te Moana Road, which would receive noise levels of between 58 and 61 dB $L_{Aeq(24h)}$. Importantly, these levels are mostly generated by traffic on the altered Te Moana Road, which requires widening to allow for ramps connecting with the Expressway.
- 76 The use of OGPA is the most effective mitigation measure when addressing road traffic noise and has therefore been chosen as the selected mitigation option for Te Moana Road. While the Project team considered alternative and additional mitigation for these dwellings (such as the use of boundary fencing), the need to retain driveway access from Te Moana Road would result in fencing providing ineffective noise mitigation. It was therefore not selected as the BPO.⁵³
- 77 The existing low noise levels in Sector 3 mean that the introduction of the Project would result in significant noise level increases of more than 9 decibels for about a third of dwellings.⁵⁴ However, none of these dwellings are predicted to receive noise levels above 57 dB $L_{Aeq(24h)}$, which means that despite the increase, the resulting noise levels are in my opinion appropriate for residential use.

Sector 4

- 78 Sector 4 is the least populated sector adjacent to the Project. Extending from north of Te Moana Road to Kowhai Road north of Peka Peka Road, the only notable settlement is at Peka Peka Road. Remaining dwellings are individual homesteads at considerable

⁴⁹ Technical Report 15, Section 7.5 'Sector 3 – Mazengarb Road to North of Te Moana Interchange'.

⁵⁰ Barriers may consist of earth bunds or fences, or in some instances a combination of earth bunds with fences along the top.

⁵¹ Te Moana Road chainage 20 to 200 metres. Attached in **Annexure B** of my evidence is a corrected figure CV-SP-120 showing OGPA on Te Moana Road (instead of asphalt as shown on the Scheme Plan set supplied with the AEE).

⁵² 31 dwellings of the 47 assessed in this sector. Refer Technical Report 15, Section 7.5 'Sector 3 – Mazengarb Road to North of Te Moana Interchange'.

⁵³ Technical Report 15, Section 7.5.6d 'West of proposed Expressway – South of Te Moana Road'.

⁵⁴ 16 dwellings of the 47 assessed in this sector.

distances from each other. I subdivided this sector into three assessment areas with a total of ten dwellings, seven of which are located in Peka Peka Road.

- 79 The Project constitutes a 'new road' for most of the alignment. Where the Expressway joins with the existing SH1, I have assessed the noise levels against the 'altered road' criteria of the Standard.⁵⁵
- 80 The Do-minimum design of the road included the use of chip seal road surface. However, the selected mitigation for Sector 4 then includes the specific use of OGPA for selected sections of the road in the vicinity of dwellings. As a result of the long distances between dwellings and the road, and the height of dwellings in relation to the road, the Project team considered that barriers would not constitute the BPO for this sector.⁵⁶
- 81 For the southern part of Sector 4 (which does not include the Peka Peka settlement), the introduction of the Expressway into a rural, low noise environment (which currently does not contain other major noise sources) would result in a significant⁵⁷ increase in noise. Mitigation for the two dwellings⁵⁸ affected in this area involves the use of OGPA in the vicinity of the dwellings. The Project team concluded that the use of barriers would result in the creation of other adverse effects, specifically visual issues, due to the height (5 metres) required to achieve noticeable further noise level reductions.⁵⁹
- 82 While the increase would constitute a significant effect given the existing low noise environment, the predicted noise level of 62 dB $L_{Aeq(24h)}$ from traffic noise is commonly experienced by residents throughout New Zealand without appreciable adverse effects.
- 83 I assessed the northern part of Sector 4 (including the Peka Peka settlement), where the Project reconnects with SH1, based on the 'altered road' criteria of the Standard due to the elevated existing noise environment from traffic on the existing SH1. The mitigation option chosen involves the use of OGPA in the vicinity of dwellings in order to mitigate the adverse noise effects of the Project. Barriers were considered by the Project team, but would need to be so long

⁵⁵ Technical Report 15, Section 5.1.2 'Noise criteria'.

⁵⁶ Technical Report 15, Section 7.6 'Sector 4 – North of Te Moana Interchange to Peka Peka Road'.

⁵⁷ A predicted noise level increase of 15 decibels.

⁵⁸ 36 and 37 End Farm Road.

⁵⁹ Technical Report 15, Section 7.6.1c 'East of proposed Expressway – End Farm Road'.

and high in order to achieve noticeable noise level reductions that they would cause adverse visual effects.⁶⁰

- 84 All dwellings, except two, would receive external noise levels between 52 and 60 dB $L_{Aeq(24h)}$. The two exceptions would receive noise levels of 64 and 67 dB $L_{Aeq(24h)}$ ⁶¹ (which is still within Category B for altered roads) and are currently located in close proximity of SH1.
- 85 For most dwellings in this Sector (which in parts adjoins the existing SH1), the noise levels would be similar to existing levels, and the effects would be generally insignificant to minor.

Effects on Built Heritage Values

- 86 **Mr Ian Bowman**, in his evidence on built heritage, discusses potential noise effects on St Luke's Church, and the Greenaway homestead.⁶² I have the following comments in relation to these buildings.
- 87 My assessment of traffic noise effects deals with effects on people in the vicinity of the Project, specifically those PPFs within 100 metres of the Expressway.⁶³ PPFs include a number of building uses, generally relating to the use of these buildings for sleeping during some time of the day.⁶⁴ Churches are not defined as PPFs in the Standard.⁶⁵
- 88 St Luke's Church⁶⁶ is located on the El Rancho site, approximately 170 metres from the closest Expressway traffic lane. It was included in the calculations discussed in Technical Report 15, Section 7.5.5 'El Rancho'. The Church is small, approximately 10 by 6 metres, and with small windows facing the Expressway alignment. The noise level reduction through the building envelope is estimated to be between 15 and 18 decibels.

⁶⁰ Technical Report 15, Section 7.6.2d 'West of proposed Expressway – Peka Peka Road'.

⁶¹ 20 Peka Peka Road and 9 Te Kowhai Road respectively. 9 Te Kowhai Road is located inside the designation boundary.

⁶² The Stringer Wind Rain house is owned by the Crown and is located inside the proposed designation boundary (refer to Scheme Plan CV-SP-106). I understand that the building is to be relocated. I support this, given the degree of traffic noise effects which would be experienced at this building, if it remained in its current location. Refer to the evidence of **Mr Ian Bowman** for further discussion on this.

⁶³ Technical Report 15, Section 5.1.1 'Assessment positions'.

⁶⁴ An exception are teaching facilities and school playgrounds within 20 metres of school buildings – here the protection is afforded to avoid disruption of teaching. Refer to the Standard, Section 1.4 'Protected Premises and Facilities'.

⁶⁵ The Guidelines also did not include churches in noise sensitive facilities to be protected.

⁶⁶ Refer to the evidence of **Mr Ian Bowman**.

- 89 The existing noise level in the vicinity of the camp is about 40 dB $L_{Aeq(24h)}$. My predictions of future noise levels are based on the Expressway in the vicinity of El Rancho. This involves the use of OGPA and a 1.1 metre high concrete edge barrier along the bridge across the Waikanae River and extending past the camp. I have calculated a noise level of 54 dB $L_{Aeq(24h)}$ at the Church façade. This noise level is well within the most stringent noise criteria Category A of the Standard, and, based on the observed construction material of the Church, would receive internal noise levels of between 36 and 39 dB $L_{Aeq(24h)}$. I consider these noise levels would not cause disturbance of services due to the small space where the congregation gathers in close proximity to each other.
- 90 Greenaway homestead⁶⁷ is approximately 120 metres from the closest Expressway traffic lane. Existing noise levels at the homestead are approximately 44 dB $L_{Aeq(24h)}$ based on surveys undertaken in the vicinity. I have predicted that noise levels received at the most exposed façade of the dwelling will be up to 51 dB $L_{Aeq(24h)}$.⁶⁸ This level is well suited for residential use, both in relation to external and internal noise levels, and will be well within the most stringent noise criteria Category A of the Standard.
- 91 Overall, I consider that, at the two sites of built heritage, the Project would generate noise levels that are in keeping with the use of these buildings.

Summary

- 92 Overall, I developed a total of 48 mitigation options for 17 assessment areas along the proposed alignment. These options were then assessed by the multi-disciplinary Project team (including myself), resulting in the recommendation of the selected mitigation options, in accordance with the Standard.
- 93 In addition, I undertook an assessment of traffic noise effects based on the predicted changes in, and the resultant, noise levels, with the implementation of the Project with the selected mitigation options.
- 94 In my opinion, the selected mitigation options would be effective and practicable for the respective situations along the alignment of the Project, and would result in noise levels that are appropriate for residential use.

RESPONSE TO SUBMISSIONS

- 95 I have read submissions lodged on the Project that raise traffic noise issues and, in this section of my evidence, I will address the issues raised.

⁶⁷ Refer to the evidence of **Mr Ian Bowman**.

⁶⁸ Technical Report 15, Appendix D, Sheet EN-NV-113.

Appropriateness of the Standard

- 96 Some submissions⁶⁹ have questioned the appropriateness of the Standard in regards to this Project, in response to recent roading projects, the provisions in the Kāpiti Coast District Plan and international road traffic noise standards.
- 97 As explained above, I have used the Standard as a basis of determining practicable noise mitigation measures, with the input from the Project team. In addition, I have undertaken a separate assessment of noise effects, based on the predicted noise level change. In my opinion, this two-pronged approach provides a thorough representation of the existing and future noise environment on the basis of established methodologies and criteria.
- 98 The District Plan, which is currently under review, contains traffic noise criteria based on the Guidelines. The Project will be within a designation, which is independent from the District Plan requirements. However, in order to provide a full assessment, one mitigation option for each assessment area⁷⁰ (which was put to the Project team for consideration) would fulfil the requirements of the Guidelines, and with that the requirements of the current District Plan.
- 99 International road traffic noise standards, similarly to the New Zealand Standard, take account of local issues and circumstances.⁷¹ The Standard criteria are comparable to international road traffic noise criteria,⁷² and are not less stringent as has been suggested by some Submitters. I do not consider it appropriate to refer to an international road traffic noise standard when there is an appropriate New Zealand Standard available. I also note that prior to adoption of the Standard, the Guidelines (a non-standard document) were widely accepted and used as the basis of road noise assessments, rather than international standards.
- 100 In my opinion, the Standard is the appropriate document to provide the methodology of determining mitigation measures and suitable noise criteria. It provides for a pragmatic and practical

⁶⁹ Including Submitters A Ryan (156), M Hanbury-Sparrow (287), L Schager (312), D Groves (461), J Weber (529), A Cherrill (630), A Carter (656), N Beechey (663).

⁷⁰ Technical Report 15, Tables 7-1, 7-2, 7-3 and 7-4 show the relevant mitigation option which would fulfil the Guidelines.

⁷¹ For example, the British road traffic noise standard (on which the Guidelines were based) applies a noise criterion at 1 metre from the façade. This is due to the lack of open space around houses, particularly city and terraced houses, which would make a free field noise criterion impracticable due to the presence of reflecting surfaces from buildings.

⁷² For example, the Victorian road traffic noise objectives set a residential noise criterion for new and altered roads of 63 dB $L_{A10(18h)}$, which is similar to 60 dB $L_{Aeq(24h)}$, i.e. within the New Zealand Category B (57 to 64 dB $L_{Aeq(24h)}$).

implementation of methods which were already established when the Guidelines were the only available document in New Zealand.

Traffic noise effects in general

- 101 A large number of Submitters⁷³ raised the issue of increased or high traffic noise levels following the opening of the Project.
- 102 As noted throughout my assessment,⁷⁴ and in my evidence,⁷⁵ the introduction of a major road into a currently low noise environment will result in a noise level increase that will vary from just noticeable to significant, depending on the location of the receivers in relation to the Expressway. Noise levels from the Expressway including the selected mitigation options, while louder than currently experienced, will be within a reasonable range suitable for residential use.
- 103 Some Submitters object to the Expressway being audible,⁷⁶ or request that noise levels should be mitigated to be similar to currently existing noise levels.⁷⁷ This is not technically feasible (apart from constructing the Expressway in a tunnel,⁷⁸ which would result in different noise issues such as ventilation and portal noise). Irrespective of the scale of noise mitigation implemented and the level of noise, the road will be audible to many receivers that are currently distant from SH1 because the character of the sound is different to existing natural sounds. However, as explained above, such a change is not inherently unreasonable or unmanageable, and in my view, will not be.

Outdoor noise

- 104 A number of Submitters⁷⁹ state that the resultant noise levels with the Expressway in place will be too high and affect outdoor amenity, such as the use of gardens and back yards.
- 105 The Standard⁸⁰ states a clear preference for structural mitigation, e.g. the use of low noise road surface and barriers, instead of the

⁷³ Including, amongst others, Submitters H Booth (2), S Kress (70), R Wallace (121), S and C Hori (224), H Hopkirk (336), M Lepionka (416), C Howard (554), R Childs (603) and G Woodward (715).

⁷⁴ Technical Report 15, throughout Section 7.

⁷⁵ At paragraphs 23 and 58.

⁷⁶ Including Submitters D Evans (211), N White (255), J Anderton and J Abigail (293), J George (376), B and J Inge (429), D Groves (461), W and D Lattey (466), D Kieboom (494), R Williment (620), J Weber (529), S West (573).

⁷⁷ Including Submitters D Hare (207) and D Bullen (248).

⁷⁸ Which has been suggested by Submitter K Dreyer (681).

⁷⁹ Including Submitters A Hager and B Laird (56), J Scrimshaw (304), C Fawthorpe (318), W Sisarich (331), M Anderson (378), R MacKay (404), K Whibley (482), J Weber (529), H Chambers (668), M and A Anderson (678), M and J Harris (713).

⁸⁰ NZS 6806:2010, Section 8.1.2.

use of building insulation measures. The noise level contours on figures EN-NV-109 to EN-NV-117 in Appendix 15.D (Technical Report 15) show the positive influence of structural mitigation measures proposed on the noise levels of neighbouring sites.

- 106 I agree with this approach as the use of structural mitigation provides protection to the widest possible area, including outdoor areas. By comparison, insulation improvements to a dwelling would serve only to mitigate the internal noise levels.
- 107 However, as I acknowledge in paragraphs 102 and 103 above, the character of the noise environment in the vicinity of the Expressway will change and noise levels will increase to a varying degree, even with the implementation of the selected mitigation measures (which are proposed by the Project team). Nevertheless, I consider that the resultant noise levels are appropriate for outdoor use and are similar to those experienced throughout New Zealand in similar circumstances.
- 108 In regards to outdoor noise levels, Submitters on behalf of Nga Manu Nature Reserve⁸¹ seek that noise mitigation, such as the use of OGPA, is provided in the vicinity of the Reserve as the site is used for education and research purposes.
- 109 Nga Manu is located approximately 450 metres from the edge of the proposed Expressway, outside even the rural 200 metre assessment area of the Standard.⁸² Figure EN-NV-226 (attached to my evidence in **Annexure C**) shows the noise level contours to the extent of the modelling undertaken, with Nga Manu being located towards the centre at the bottom of the page. Noise levels are predicted to be well within the most stringent noise criteria category A and would be less than 50 dB $L_{Aeq(24h)}$ on the site, and generally in the mid-40 dB range. These are appropriately low noise levels for the activities undertaken on-site, in my opinion. I do not consider that the use of OGPA in the vicinity of this site is either required or appropriate.

Assessment of receivers between 100 and 200 m

- 110 A number of Submitters⁸³ request that the assessment area be expanded to include receivers within 200 metres of the alignment, not only 100 metres in accordance with the Standard's requirements. My assessment has identified every PPF within 100

⁸¹ Submitters R McKenzie (46) and B Benseman (90). A further submission by J Anderton and J Abigail (293) in relation to Nga Manu Nature Reserve is of more general content.

⁸² Standard, Section 1.3 'Limitations', 1.3.1 (e).

⁸³ Including Submitters F Jeffries (388), I Mackay (402), J Nisbet (649), T Begovich (651), A Carter (656).

metres of the alignment, and I have reported individual noise levels for each of these locations.⁸⁴

- 111 In order to be able to respond to the Submitters' request, I have added a graphical representation of the 100 and 200 metre lines to the selected mitigation option noise level contours. In order to provide ease of interpretation, I have changed the colours of the contours from those contained in Technical Report 15.⁸⁵ Instead, I have provided contours that include the Category A noise level (57 dB $L_{Aeq(24h)}$). These contours are included on figures EN-NV-220 to 228 in **Annexure C** of my evidence.
- 112 The contours show that all dwellings except one located outside the 100 metre area are within the most stringent Category A (i.e. are predicted to receive noise levels of 57 dB $L_{Aeq(24h)}$ or less). One dwelling at 160 Greenhill Road is predicted to receive a noise level of just over 60 dB $L_{Aeq(24h)}$ which is within the Category B criterion of up to 64 dB $L_{Aeq(24h)}$.
- 113 Therefore, I consider that the assessment area of 100 metres is appropriate under these circumstances, and extending the assessment area to 200 metres is unlikely to have changed the mitigation options selected by the Project team and proposed to the BoI.

Mitigation measures

- 114 Several submissions address the selection of proposed mitigation measures, either supporting or opposing them. Comments are directed at the selection of the road surface material⁸⁶ and the location and/or height of barriers,⁸⁷ and the request for monitoring⁸⁸ to show that mitigation measures function as predicted. I address these matters below.

⁸⁴ Technical Report 15, Appendix 15.B.

⁸⁵ Technical Report 15, Appendix 15.D.

⁸⁶ Including Submitters Friends of Waikanae River (59), E Cornick (65), B Frazer (103), D Hanbury-Sparrow (110), A Ryan (156), P Canvin (234), C and M Dearden (261), M Hanbury-Sparrow (287), L Schager (312), B and J Inge (429), I Bagshaw (431), J Leighton (454), R and W Love (470), G and T Grieve (474), L Allan (524), J Weber (529), M Ellis (534), S Houston and R Lord (566), H McKenzie (605), N Alexander and R Neilson (619), T Brown (650), T Begovich (651), M McKenzie (685).

⁸⁷ Including Submitters E Cornick (65), L James and P Tong (228), S Ansell (229), P Canvin (234), J Watson (241), W Mansfield (251), D and D Waterson (267), P Scrimshaw (307), L Shcager (312), N and B Mountier (327), W Sisarich (331), C Clayton (353), E and B Waterhouse (432), J Leighton (454), W and D Lattey (466), R and W Love (470), D Page (473), G and T Grieve (474), S Gasson (510), L Allan (524), S Arnold (567), N Alexander and R Neilson (619), R Halliday (639), H Donaldson (683), P Wood and A Moul (696), E Jones (709).

⁸⁸ Including Submitters M Hare (209), P Aregger (382), T Daniell (417), H Donaldson (683).

OGPA

- 115 In general, submissions acknowledge and support/request the use of low noise road surface, e.g. OGPA.⁸⁹ Some Submitters⁹⁰ appear to misunderstand how the mitigation measures were arrived at, and believe that different “noise standards” were applied to “rural” and “urban” areas. This is not the case. The criteria categories and assessment area applicable to the Project, in accordance with the Standard, is the same for the entire alignment, i.e. urban and 100 metres.
- 116 The selection of OGPA for Sectors 1 to 3 was undertaken prior to the commencement of my assessment, as discussed in paragraph 54 above. Through the development of the BPO for noise mitigation measures, the road surface material OGPA was selected as the recommended mitigation measure in the vicinity of all dwellings in Sector 4 which were otherwise predicted to be in a less stringent noise criteria category than A. This includes the use of OGPA in the vicinity of Ferndale Subdivision, End Farm Road and Peka Peka Road.
- 117 A number of submissions were received from the Ferndale Subdivision, north of Te Moana Road. These submissions seek that the use of OGPA be extended to the northern boundary of the subdivision. I understand that this is intended and the scheme assessment plans⁹¹ show the use of OGPA up to chainage 1300. I have updated my computer model to reflect the extension of OGPA to this point, and two plans showing the noise level contours are attached to my evidence (see **Annexure C**).⁹²
- 118 Several of the Submitters addressing the use of OGPA seek assurance that the road surface proposed will be installed as shown on the plans and maintained. This is ensured by the implementation of proposed conditions DC.39, DC.41 and DC.48.^{93,94}

Barriers

- 119 The use of barriers for noise mitigation is discussed by many Submitters, and some question their effectiveness. Barriers function

⁸⁹ Including Submitter D Hanbury-Sparrow (110), who supports the use of OGPA specifically in parts of Sector 4 to benefit the wider area, as included in the proposed mitigation option 2 in relation to the End Farm Road dwellings. (Refer Scheme Plan CV-SP-122 and Figures EN-NV-225 and 226 in **Annexure C**),

⁹⁰ Including Submitters M Hanbury-Sparrow (287), B and J Inge (429), I Bagshaw (431), S Arnold (567).

⁹¹ CV-SP-122 to 125, Scheme Plans (Te Moana Road to Smithfield Road).

⁹² Figure EN-NV-225 and 226.

⁹³ Submitter T Brown (650) seeks that all noise mitigation measures be maintained as set out in the recommended conditions.

⁹⁴ For ease of reference the recommended construction noise and vibration conditions are attached in **Annexure E**.

most effectively when they break acoustic line-of-sight, i.e. when the line between the noise source and a receiver is interrupted by a solid object.⁹⁵ Therefore, planting and vegetation are not considered to provide noise mitigation and are not used for noise mitigation purposes.⁹⁶

- 120 The barriers included in the selected mitigation options achieve effective noise level reduction for relevant receivers. In some instances, barriers have not been put forward in the mitigation options proposed because of other design considerations, mainly urban design and visual impact. This is documented in the various tables in Appendix 15.C of Technical Report 15.
- 121 The noise level reductions achieved by the proposed barriers are best seen when comparing the respective figures of EN-NV-100 to 108 and EN-NV-109 to 117 in Technical Report 15, Appendix 15.D. In most instances, barriers provide the most protection to dwellings adjacent to the Expressway (i.e. those most affected by the Project), while dwellings in the second row and beyond already receive considerably lower noise levels due to shielding from the intervening houses.
- 122 The selected noise mitigation measures do not represent the “minimum” or cheapest mitigation option, as suggested by some Submitters. In many instances, the mitigation proposed to be provided is not the most cost effective,⁹⁷ and proposed barriers are generally not those just achieving Category A, but providing a range of noise level reductions as practicable.⁹⁸

Monitoring

- 123 A number of Submitters seek assurance, through post construction traffic noise monitoring, that noise levels will achieve the predicted noise level categories. I consider that this is addressed in proposed condition DC.50.

⁹⁵ Technical Report 15, Section 6.3.2.

⁹⁶ However, vegetation can provide effective visual shielding as discussed in **Mr Boyden Evans'** evidence.

⁹⁷ For instance the selection of OGPA for the two dwellings in End Farm Road. At those sites, provision of sound insulation would have been more cost effective, but would have left the outdoor area in the vicinity of these dwellings more affected. Therefore, mitigation measures are generally aimed at closest houses as more distant ones receive additional, albeit limited, benefit from the mitigation for those houses.

⁹⁸ For instance between Kāpiti and Mazengarb Roads, where an earth bund is proposed to be constructed to a height of the existing dunes, in excess of what is required to achieve Category A for many houses.

House insulation

- 124 A number of Submitters⁹⁹ question if, or seek that, double glazing or similar upgrades to dwelling envelopes will be provided. All dwellings outside the designation are predicted to receive external noise levels which will result in appropriate internal noise levels, as discussed in paragraphs 43 to 49 above.
- 125 I do not support the installation of sound insulation for dwellings as an alternative to the provision of external noise mitigation measures as the mitigation effects would be limited to inside the house only. As noted by many Submitters,¹⁰⁰ outdoor living is important in New Zealand, and this has to be recognised when selecting mitigation options.

Meteorological conditions

- 126 Several Submitters¹⁰¹ state that noise levels will increase with certain meteorological conditions, e.g. wind from a specific direction or still nights during which temperature inversions¹⁰² occur, and that the noise level predictions have not taken account of this.
- 127 It is correct that noise levels increase in downwind and inversion circumstances because sound waves bend towards the ground. The traffic noise prediction methodology takes account of "moderately adverse wind velocities",¹⁰³ i.e. moderate downwind conditions.
- 128 In accordance with ISO 9613-2:1009,¹⁰⁴ these conditions imply that they are also applicable to "*a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.*"¹⁰⁵

⁹⁹ Including Submitters J Murray (13), C Watson (126), H and J Patten (206), D and D Waterson (267), J Scrimshaw (304), L Schager (312), W Sisarich (331), P Aregger (382), T Daniell (417), R and W Love (470), S Houston and R Lord (566), N Alexander and R Neilson (619), M and A Anderson (678), H Donaldson (683), M Starke (690), M and J Harris (713), R Snyders (720), H Farr (727).

¹⁰⁰ Refer paragraphs 104 to 106 above.

¹⁰¹ Including Submitters I and J Pears (4), M Hare (209), P Scrimshaw (307), D Hipkins (385), R and W Love (470), S Arnold (567), Alliance for a Sustainable Kāpiti (572), K Saint (607), R Williment (620), N Beechey (663).

¹⁰² A temperature inversion generally occurs at night, particularly in winter, when the air close to the ground becomes very cold and the temperature no longer decreases with height, as is normal. This causes the sound to be bent downwards.

¹⁰³ Refer Technical Report 15, Section 6.2.

¹⁰⁴ ISO 9613-2:1996 "Acoustics – Attenuation of sound during propagation outdoors".

¹⁰⁵ ISO 9613-2:1996, Section 5 "Meteorological conditions".

Night-time noise

- 129 A number of Submitters¹⁰⁶ comments on the fact that existing night-time noise levels are particularly low, and that distant noise sources such as the sea and the rail can be heard. The reasons for this are twofold: at nights, temperature inversions occur, particularly during still nights; and background noise levels from people's activities, wildlife and wind are greatly reduced, thus sounds are heard more clearly without the daytime masking noise.
- 130 As noted in paragraph 102 above, the introduction of the Expressway, or in fact any new noise source, will result in a change in noise environment. The noise mitigation measures selected by the Project team will achieve effective noise level reductions and appropriate night-time noise levels. Nevertheless, it is accepted that the overall night time noise level will be higher than is currently experienced.

Truck noise

- 131 Submitters¹⁰⁷ are concerned about truck noise in general and the use of engine braking at the ramps.
- 132 The percentage of trucks projected to use the Expressway is relatively high¹⁰⁸ at between 14 and 22% on the Expressway, and between 3 and 14% on the interchange ramps. The traffic noise prediction method¹⁰⁹ used takes account of the number of trucks on the road.
- 133 The Standard (similarly to the Guidelines) does not provide for individual vehicle noise, such as engine braking or modified exhausts, to be assessed. Therefore, my assessment of traffic noise effects does not take account of individual noise sources. While overall noise levels from the Project will be mitigated, individual sources will be audible above the general sound.
- 134 However, I note that most of the alignment is flat, and that it is unlikely that trucks would use engine brakes on the main Expressway. An exception may be the ramps, where the

¹⁰⁶ Including Submitters H and J Patten (206), R Mackay (404), W and D Lattey (466), J Gradwell (481), K Whibley (482), Smart Transport Network (484), D Kieboom (494), R Pugh (495), S Edbrooke (517), J Weber (529), Z Beechey-Gradwell (597), N Fisher (610), R Williment (620), T Brown (650), N Beechey (663).

¹⁰⁷ Including Submitters H Ellis(5), P and M Smith (11), A Cairncross (180), H and J Patten (206), L James and P Tong (228), T Jack (259), J Scrimshaw (304), D Hipkins (385), M Eggers (410), J Leighton (454), W and D Lattey (466), D Kieboom (494), S West (573), Z Beechey-Gradwell (597), H Smith (602), Baray Holdings Ltd (635), T Brown (650), P Wood and A Moul (696), L Niccol, E and E Abernethy (719), H Farr (727).

¹⁰⁸ Compared with the current percentage of heavy vehicles in the Kāpiti Coast area on SH1, which is around 8 %.

¹⁰⁹ Technical Report 15, Section 6.2.3.

percentage of trucks is considerably lower than on the main Expressway alignment.

- 135 There are very limited mitigation options that can be applied to the issue of engine braking, the most obvious being the installation of “Engine Brake Restriction” signs. In my opinion, these signs would be a suitable and effective mitigation and management measure for dealing with the noise from engine braking.

Reduction of speed limit

- 136 Some Submitters¹¹⁰ seek that the speed limit on the Expressway be reduced, e.g. from 100 km/h to 80 km/h in order to reduce traffic noise levels. I discuss in Technical Report 15, Section 6.3.5 that such speed reduction would result in a small, and ultimately unnoticeable, noise level reduction of approximately 1 decibel only. Therefore, I do not consider a reduction in speed limit is justified for the purpose of noise mitigation.

Western Link Road effects

- 137 A number of Submitters¹¹¹ refer to the Western Link Road (WLR) as having lesser effects, as compared with the proposed Expressway. In order to be able to respond, I have entered an indicative model of the previously proposed WLR, based on information I gathered from the documentation of the previous hearing. My model is based on a number of assumptions¹¹² which means that the results should be approached with a degree of caution. However, I consider that the overview noise level contours produced from the model give an appropriate indication of potential noise effects from the WLR.
- 138 Figures showing the indicative noise level contours of the WLR are shown on figures EN-NV-300 to 308 in **Annexure D**. While the alignments are not directly comparable in some parts, e.g. in the vicinity of Te Moana Road, in other areas they are aligned, e.g. between Kāpiti and Mazengarb Roads. As can be seen when comparing figure EN-NV-302 (in **Annexure D**) and EN-NV-222 (in **Annexure C**), noise levels are similar for both roads for houses at Makarini Street and surrounding roads fronting the designation.

¹¹⁰ Including Submitters N Alexander and R Neilson (619), M McKenzie (685), J Chappell (691).

¹¹¹ Including Submitters A Ryan (156), J Watson (241), N Fisher (610), B and R Usmar (660).

¹¹² The alignment is indicative, based on the consented designation. Traffic volumes have been obtained from Hearing evidence as between 15,000 and 19,000 vehicles per day, with 5% heavy vehicles. The traffic speed was also based on Hearing evidence, being 50 km/h between Poplar Avenue and Mazengarb Road, and 70 km/h from Mazengarb Road to Peka Peka Road. A road surface material of asphalt has been assumed. Where the road would have been elevated due to topography, the road has been lowered into a cut to remain generally at a similar level throughout the alignment.

- 139 As repeatedly stated, the existing ambient noise environment is very quiet for many areas along the alignment, and the introduction of any new noise source, may it be an Expressway or a link road, such as the WLR, would result in noticeable noise level increases and a change in character of the noise environment.

Elevation of road on embankments and bridges

- 140 Submitters¹¹³ are concerned about the noise effect from raising parts of the alignment, such as where the road is on a fill or bridge crossing local roads. Submitters query if, and how, traffic noise in this circumstance can be mitigated.
- 141 As noted previously in paragraph 119, noise is most effectively mitigated when the line between the noise source and the receiver is interrupted. Where a noise source is elevated above the surrounding terrain (e.g. a road on a bridge), mitigation is effectively achieved by placing barriers on the edge of the alignment.
- 142 This is proposed for all Expressway bridges along the alignment.¹¹⁴ Where mitigation along the alignment is proposed, this is placed in the most appropriate location to effectively mitigate noise, i.e. where the road is elevated above the surrounding terrain, barriers are recommended to be located on the (elevated) road side.¹¹⁵

Specific Submitters

- 143 The following paragraphs address the concerns of Submitters potentially particularly affected by the Expressway alignment and the submissions by residents groups.

P and M Smith (11)

- 144 P and M Smith reside in one of the closest dwellings to the alignment, adjacent to the Kāpiti Road interchange.¹¹⁶ In their submission, they are concerned about the limited distance from the house to the road, the proposed barriers, traffic noise in general and the noise from trucks using the off ramp, changing gears and using engine braking.
- 145 During the development of the proposed mitigation options, the Smith dwelling received particular attention, as the team was conscious that too high a barrier at the residential boundary would

¹¹³ Including Submitters A Ryan (156), G Griffis (245), J Gradwell (481), S Edbrooke (517), W Hamilton (532), K Saint (607), N Alexander and R Neilson (619), P Cherrill (632), B and R Usmar (660), P Wood and A Moul (696), E Jones (709).

¹¹⁴ As shown on figures EN-NV-001 to 016 in Technical Report 15, Appendix 15.B in green (bridge barrier).

¹¹⁵ For instance, as shown on Figures EN-NV-002 and 007 in Technical Report 15, Appendix 15.B.

¹¹⁶ The dwelling is located at 51 Milne Drive, Paraparaumu.

cause adverse visual effects.¹¹⁷ Therefore, a combination of several barriers was put forward, in keeping with the residential character of the site, whilst also avoiding safety issues for the cycleway. The barrier along the property boundary is proposed to be 2 m in height, which is a common height for residential boundary fences. While higher barriers are proposed to be installed adjacent to the ramp and Expressway, these will be more distant from the property. The noise level reduction achieved with this barrier arrangement is predicted to be 8 to 9 decibels, when compared with the Do-minimum option.

146 With the proposed mitigation measures in place, I have predicted an external noise level of 57 dB $L_{Aeq(24h)}$ at the dwelling. This is at the upper end of the Category A criterion category. As discussed in paragraphs 46 to 49 above, with such a daily average noise level, night-time and internal noise levels will be within an appropriate noise level range for residential use.

147 I have addressed the issue of engine braking of trucks in paragraph 133 above. While signage and the proposed barriers will help in reducing the overall effect of trucks using the Kāpiti Road northbound off ramp, trucks will remain audible above the general road noise, though at a lower level.

M Craig and J Anderson (678)

148 M Craig and J Anderson's dwelling is in close proximity to the Expressway, in the area south of Kāpiti Road.¹¹⁸ I understand that their concern is that the acoustic boundary fence proposed does not extend along their entire residential boundary, but that only Mitigation option 4a is shown.¹¹⁹ I consider that, while option 4a shows the minimum requirement and achieves a similar noise level reduction to option 4, providing barriers as set out in option 4¹²⁰ will result in a more coherent outcome, as discussed by **Mr Marc Baily**.

E Leonard-Taylor (594)

149 Ms Leonard-Taylor's dwelling is located east of the Expressway and north of El Rancho.¹²¹ The Submitter is concerned that the El Rancho access is not correctly included in the computer noise model "which gives direct line of sight to the bridge". The El Rancho access comes off the end of Kauri Road and is proposed to be relocated towards

¹¹⁷ Technical Report 15, Section 7.4.3f and g.

¹¹⁸ The dwelling is located at 17 Datum Way, Paraparaumu.

¹¹⁹ Technical Report 15, Appendix 15.C, Sheet EN-NV-040. Mitigation option 4a consists of several 2 metre high boundary fences only in those locations that require mitigation to achieve noise levels within Category A.

¹²⁰ Technical Report 15, Appendix 15.C, Sheet EN-NV-039. Mitigation option 4 consists of a 2 metre high boundary fence extending the entire length of residential properties south of Kāpiti Road and west of the Expressway.

¹²¹ This dwelling is located at 23 Kauri Road, Waikanae.

the Waikanae River thus requiring only one (longer) bridge rather than two bridges (one over Waikanae River and one over the El Rancho access).¹²²

- 150 My computer noise model shows the access way with its current alignment, i.e. resulting in two bridges with a gap in the bridge edge barrier between the bridges.¹²³ While the alignment of the access way has changed, this will result in a small benefit to the Submitter as the bridge barrier would continue for a longer extent, breaking line-of-sight from traffic to the dwelling.
- 151 I have calculated the noise levels at the PPFs in the area and found that noise levels are within 0.2 decibels of those modelled with the existing access way alignment. Therefore, I do not consider this change to have any material effect on the dwellings in the Kauri Road area and that no additional noise mitigation would be required.

Residents of the Ferndale Subdivision (605, 651, 679, 685)

- 152 A number of Submitters¹²⁴ are associated with the Ferndale Subdivision, located between Te Moana and Ngarara Roads and east of the Expressway. They seek that the subdivision be included in mitigation considerations despite not constituting a PPF (because only existing dwellings have been assessed in accordance with the Standard). Specifically, Submitters seek that OGPA be extended to a point 500 metres north of the subdivision, that existing dunes be retained, amongst others, for noise attenuation purposes and that speed be limited to 80 km/h in the vicinity of the subdivision.
- 153 I have predicted noise levels from the Expressway, and noise level contours are shown on Figures EN-NV-225 and 226 in **Annexure C**. Noise levels are predicted to range from less than 45 to 51 dB $L_{Aeq(24h)}$ which is well within the most stringent noise criteria Category A of the Standard. I consider that such external noise levels are appropriate and suitable for residential use and would not interfere with residential activities on the site.
- 154 The noise level modelling indicates that the terrain will provide shielding as can be seen on Figure 226 (**Annexure C**) where the noise level contours are compressed close to the Expressway.
- 155 I have already discussed that reducing the speed from 100 to 80 km/h¹²⁵ would have an insignificant effect, and I do not consider it necessary.

¹²² Scheme Plan CV-SP-118.

¹²³ Technical Report 15, Appendix 15.B, Figure EN-NV-009.

¹²⁴ Including Submitters H McKenzie (605), T Begovich (651), G Thornley (679), M McKenzie (685).

¹²⁵ In paragraph 136 above.

Paraparaumu Medical Centre (521)

- 156 The Submitter is concerned about noise from the new Kāpiti Road southbound off ramp, which lies adjacent to the Centre site. With the proposed mitigation (i.e. OGPA and barriers on the ramp and Expressway proper), the noise level at the Centre site is predicted to be 54 dB $L_{Aeq(24h)}$ (i.e. within Category A). From observation, traffic noise from Kāpiti Road is currently higher than the noise level predicted from the Expressway, and I consider that the Expressway would have a no more than minor noise effect on the Medical Centre. I also note that I have recommended a substantial construction noise barrier along the western boundary of the Centre. Should this construction noise barrier be retained post-construction at a residential scale (e.g. at 2 metres height), traffic noise levels from the Expressway would be even lower.¹²⁶ In either case, no building modification mitigation would be required for the Medical Centre to continue operating.

Metlifecare Kāpiti Ltd (608)

- 157 Metlifecare Kāpiti Ltd operates the Kāpiti Retirement Village just south of Mazengarb Road. The submission notes that noise levels will increase by between 3 and 12 decibels (for the most affected dwellings within 100 m of the Expressway), and that the proposed bund/barrier along the eastern boundary of the Village would produce adverse amenity effects.
- 158 I have reviewed the selected mitigation option (which is proposed by the Project team) and note that the Submitter misread the recommendations. The 4 m bund referred to in the submission was part of Mitigation option 1.¹²⁷ However, Mitigation option 3 was preferred by the Project team as it achieved a significant noise level reduction while avoiding amenity issues of very high barriers. Mitigation option 3 involves the retention of the existing 2.5 m high bund along the eastern boundary of the retirement village and extends the mitigation by means of a 2.5 m high barrier along the Expressway edge, thus achieving effective mitigation without causing adverse visual effects.¹²⁸
- 159 All dwellings within the retirement village would receive noise levels of 57 dB $L_{Aeq(24h)}$ or less (i.e. within Category A).

Waikanae Christian Holiday Park (El Rancho) (477)

- 160 Waikanae Christian Holiday Park (referred to as *El Rancho*) retained Malcolm Hunt Associates (*MHA*) to undertake a review of my noise assessment, in relation to the potential noise effects on El Rancho (*the MHA report*). The MHA report was attached to El Rancho's submission.

¹²⁶ This could be discussed and decided in consultation with the Medical Centre.

¹²⁷ Technical Report 15, Section 7.4.5c.

¹²⁸ Technical Report 15, Section 7.4.5e and f.

- 161 The MHA report summarises existing and predicted future noise levels on the site, applies the requirements of the Standard to the site and provides recommendations as to potential additional mitigation. Overall, I am in general agreement with the MHA assessment, particularly in regards to the fact that the predicted noise levels are *"not considered likely to adversely affect the operation of El Rancho"*.¹²⁹
- 162 The recommendations of the MHA report extend to indoor noise levels of St Luke's Church. The MHA report suggests that a voice amplification system could be installed. As discussed in paragraphs 88 and 89, in my opinion the noise levels predicted at the façade of this Church do not give rise to potential disturbance of services, given the orientation of the Church, the building envelope and its small size. Therefore, I do not consider that installation of a voice amplification system is required as mitigation for this Project.
- 163 A further recommendation of the MHA report relates to the replacement of louvred windows at Poplar Lodge, the closest camp bunkroom to the Expressway. The external noise level predicted at this bunkroom (which is outside the 100 m assessment area) is 54 dB $L_{Aeq(24h)}$. Based on the diurnal variation in noise level provided by the MHA report (Figure 6), for an external daily noise level of 54 dB the night-time noise level would vary from about 45 dB at the beginning and end of night-time, and 40 dB during the middle of the night. Even with windows (including louvred windows) ajar, a noise level reduction of 10 to 15 decibels can be achieved, thus resulting in night-time internal noise levels of 25 to 35 dB L_{Aeq} . These levels are considered appropriate for sleeping areas, and are within the range suggested by AS/NZS2107:2000 referenced by the MHA report. Therefore, I do not consider that replacement of the louvred windows is required as mitigation for this Project.
- 164 El Rancho, in its submission, seeks the following (which is not covered in the MHA report):
- 164.1 Installation of a 2m barrier along the western side of the Expressway in the vicinity of El Rancho and a 1.1m barrier along the western side of the bridge – I agree with the installation of a 1.1 metre high barrier along the western side of Waikanae bridge and a continuance of this barrier past El Rancho.¹³⁰ Replacing the 1.1 metre high barrier past the bridge with a 2 metre high barrier will have a negligible effect (1 decibel noise level reduction except for the hall, where a 2 decibel reduction may be achieved).¹³¹ I therefore do not

¹²⁹ MHA report, paragraph 8.4.

¹³⁰ As is proposed in the proposed mitigation options, refer Technical Report 15, Appendix 15.B, Figure EN-NV-009.

¹³¹ Refer Technical Report 15, Section 6.5 for a subjective response to noise level changes.

- consider the effects being sufficient to warrant the installation of a higher barrier;
- 164.2 OGPA on the Expressway from at least the Waikanae bridge to Te Moana Road – this is addressed in Technical Report 15, Appendix 15.B¹³², and I am in support of the use of OGPA at this location;
- 164.3 Smooth bridge expansion joints that will minimise road noise – I agree that it is desirable for the expansion joints to be installed such that the noise from car tires impacting will be reduced. Appropriate options will be investigated during the design stage to achieve this.
- 164.4 Insulation to sleeping areas within the camp – this is addressed in paragraph 163 above;
- 164.5 Mitigation of the Church so that daytime design limits are not exceeded – this is addressed in paragraph 162 above;
- 164.6 Monitoring of traffic noise levels at pre-set intervals – this is addressed in proposed condition DC.50. I do not consider monitoring additional to that set out in the proposed condition to be of any benefit;
- 164.7 For noise effects to be no greater than would have been for the WLR – The noise criteria set in the WLR designation relate to the Guidelines. I address this issue in more detail below.
- 165 The noise criteria for the WLR (which are based on the Guidelines) included external noise criteria, specifically a noise limit of 55 dB $L_{Aeq(24h)}$ at dwellings, and internal criteria of 40 dB $L_{Aeq(24h)}$ in dwellings and 45 dB $L_{Aeq(24h)}$ in teaching areas. No noise criteria were included for St Luke’s Church which is neither a dwelling nor a teaching area, and would not have been protected under the Guidelines.
- 166 As shown in my predictions for the Expressway, (which are reproduced in the MHA report in Table 1), the external noise criterion of 55 dB $L_{Aeq(24h)}$ is predicted to be met at all dwellings, with the exception of Kauri Hall, where a 1 decibel exceedance is predicted. An internal noise criterion of 40 dB $L_{Aeq(24h)}$ is predicted to be achieved in all buildings.
- 167 Overall, I consider that the noise effects from the Expressway would be no greater than would have been the case based on the requirements of the WLR designation.

¹³² Technical Report 15, Section 7.5.4 b.

Kāpiti Coast District Council (682)

168 The submission of the Kāpiti Coast District Council (KCDC) discusses a number of issues as follows:

168.1 Paragraph 116: Whether PPFs between 100 and 200 m from the alignment should be assessed;

168.2 Paragraph 117: Whether the use of the Standard is appropriate in light of the decisions made by the BoIs for the Waterview and Transmission Gully projects;

168.3 Paragraph 117: Whether it would be more appropriate to use the District Plan requirements (i.e. the Guidelines);

168.4 Paragraph 117: Whether the selected mitigation is appropriate;

168.5 Paragraph 122: Seeks support for the suggestion that there will be noise benefits along the existing SH1; and

168.6 Paragraph 127: Whether sensitive areas and recreational areas are assessed in relation to traffic noise effects.

I address these issues below.

169 I have discussed my findings regarding PPFs located between 100 and 200 metres from the alignment in paragraphs 110 to 113 above and consider that, in this instance, no further assessment is required.

170 I have discussed the application of the Standard in relation to this Project in paragraphs 96 to 100 above. I remain of the opinion that the Standard is the appropriate document to base my determination of criteria and mitigation on.¹³³ The Guidelines, a document generally accepted by the Courts, was an NZTA internal document produced in the absence of a national standard, and is now some 21 years old. Instead, Standards New Zealand led the development of an independent national road traffic noise standard which incorporates many of the methodologies that are currently, and have been in the past, used to derive appropriate mitigation measures for road traffic noise projects. The criteria are, in my opinion, appropriate, particularly for new roads where the criteria are in line with international standards.

171 I have reviewed the Waterview and Transmission Gully BoI decisions and offer the following comments:

¹³³ Noting my comments above, that in addition to my assessment under the Standard, I have also conducted a separate assessment of human response to noise level changes.

- 171.1 The Waterview project was of a different scale, nature and environment, and in my opinion it is inappropriate to attempt to compare the Expressway with the Waterview project.
- 171.2 The Transmission Gully project resulted in designation conditions which, if applied to the Expressway, would result in no changes to the mitigation measures selected (and proposed to the BoI) by the Project team. The selected mitigation, particularly the extensive use of OGPA, in combination with the barriers, is predicted to result in noise levels which would not trigger any of the requirements in the Transmission Gully decision (which appear to be in addition to the requirements of the Standard).
- 172 As noted above, I do not consider the Guidelines, and consequently the KCDC District Plan provisions, to provide an appropriate framework for the noise mitigation design for this Project. The selected noise mitigation options result in effective noise level reductions while avoiding other adverse effects. The multi disciplined approach, which was adopted for the selection of noise mitigation measures means that there is far reduced risk of the selected mitigation options being rendered impractical at a later stage (due to, for example, adverse visual, social effects etc).
- 173 The traffic volume reduction on the existing SH1 is predicted to be between 33 and 57%, based on the traffic data provided by Beca.¹³⁴ This would equate to a noise level reduction of between 2 and 3 decibels, which is a small to just noticeable change. Due to the existing high traffic noise levels on the existing SH1, I consider such reduction to be beneficial.
- 174 In relation to the assessed PPFs, recreational areas or other non-PPFs (i.e. receivers not referred to in the Standard as PPFs) have not been included in the assessment. I note that the KCDC District Plan also makes no allowance for traffic noise protection for these areas, which aligns with the Guidelines. However, where these areas are in the vicinity of PPFs (e.g. the Waikanae River), selected mitigation for the PPFs would also benefit adjacent recreational areas.
- 175 I note that the submission of the Raumati South Residents Association (707) mirrors that of KCDC in relation to traffic noise issues. It has therefore also been addressed in the above paragraphs.

¹³⁴ Refer Technical Report 34, Table 6.1 on page 53.

RESPONSE TO SECTION 149G(3) KEY ISSUES REPORT

- 176 KCDC has provided a Section 149G(3) RMA Key Issues Report (dated 8 June 2012) (*KCDC Report*), which I have read as it pertains to noise issues. In general, the following issues have been noted.¹³⁵
- 177 The KCDC Report raised the issue of loss of amenity resulting from noise generated from the operation of the proposed Expressway on existing and future residential and rural/residential development.¹³⁶ This issue has already been addressed in my evidence¹³⁷ and throughout Section 7 of Technical Report 15. In summary, it is acknowledged that irrespective of mitigation implemented, the introduction of a new major noise source into a currently largely low-noise environment will result in adverse effects due to the change in noise level. Nevertheless, I consider that the resultant noise levels with the Expressway in place and proposed mitigation implemented will be appropriate for residential use and are similar to noise levels experienced throughout residential areas in New Zealand.
- 178 The KCDC Report raised the issue of the adequacy of mitigation proposed for the operation of the proposed Expressway (e.g. the road surface materials, buffers, noise bunds and walls).¹³⁸ I have discussed this issue extensively in my evidence;¹³⁹ particularly the methodology applied to arrive at the selected mitigation measures and the input provided by other Project disciplines to put forward practicable measures that mitigate noise while avoiding other adverse effects. This has also been addressed throughout Sections 5.1.4, 5.1.5 and 7 of Technical Report 15.
- 179 The KCDC Report requests clarification on the applicability of traffic noise criteria at dwellings, specifically if the criteria apply at existing dwellings, future dwellings or future dwellings on residential land only.¹⁴⁰

¹³⁵ The section 149G(3) report produced by Greater Wellington Regional Council does not raise noise issues.

¹³⁶ Section 149G(3) report, Section C.14, page 36.

¹³⁷ At paragraphs 23 and 58 to 60.

¹³⁸ Section 149G(3) report, Section C.14, page 36.

¹³⁹ At paragraphs 24 to 27, 30 and 53 to 56.

¹⁴⁰ Section 149G(3) report, Section C.14, page 46.

180 In that regard, the Standard states:

"1.4 Protected Premises and Facilities

1.4.1

PPFs do not include:

(g) Premises and facilities which are not yet built, other than premises and facilities for which a building consent has been obtained which has not yet lapsed.

1.4.2

The first RMA authorisation obtained for the construction of a new or altered road should identify the PPFs affected by that new or altered road. An RMA authorisation should include PPFs that have already been built and any PPFs for which a building consent has been obtained which has not lapsed (even if they have not yet been built).

C.1.4.2 [...] Where the first RMA authorisation for a new or altered road identifies the PPFs in relation to that new or altered road and a noise-sensitive activity that is not identified in the RMA authorisation is established in proximity to the site of the new or altered road, that activity will for the purposes of this Standard, not be a PPF in relation to that new or altered road."

In accordance with the Standard, I have assessed all dwellings and other PPFs that existed, or had building consent,¹⁴¹ at the time of the preparation of the AEE, up to lodgement of the NoR.¹⁴²

181 There are several reasons for this exclusion of future land use. Namely, the assessment of traffic noise levels at the façade requires knowledge as to the location of the dwelling on site. For a dwelling which already has been granted building consent, the location on site is known and can be used to base noise level predictions on. Other developments, e.g. where a future development area has been identified or where a subdivision consent has been granted, do not provide the same level of accuracy.

¹⁴¹ To my knowledge, there were no buildings consents for PPFs within 100 metres of the Project which had not been given effect to.

¹⁴² I note that the Guidelines also excluded all future land uses in respect of assessment of road traffic noise on State highways. The Guidelines state: "These road traffic noise criteria apply to the following types of existing facilities ...". (refer Section 2 'Noise Sensitive Facilities to be Protected', page 7).

- 182 Once a roading project has been notified, there are several opportunities for a future development or dwelling to be designed to accommodate the future noise source. For future development areas, buffers can be provided, e.g. green belts between the road and the development. Dwellings can be located on the sites to have non-habitable¹⁴³ and noise-insensitive¹⁴⁴ rooms facing the road or can be located on their site furthest away from the road. In addition, a new dwelling could, and under modern Building Code requirements probably would be required to, incorporate building modification mitigation such as double glazing or insulation in its construction.
- 183 I consider that it is not practicable to provide mitigation for potential future developments as the mitigation measures may not be suitable or appropriate. It would not be known, for instance, if any future development would contain single, double or higher storey dwellings, where these would be located on the site, if the installation of barriers would result in other adverse effects such as shading or safety issues.
- 184 Therefore, I consider that the exclusion of potential future developments, in accordance with the Standard, is appropriate. Nevertheless, the proposed mitigation options, particularly the use of OGPA and, to a more focussed degree, barriers will also benefit the wider area, including sites which may be developed for residential use in the future.

RESPONSE TO THE BOI'S SECTION 92 REQUEST

- 185 I have reviewed the section 92 RMA request made by the BoI (by letter dated 7 August 2012) and in this section of my evidence I will address matters identified in Appendix One relating to noise standards.
- 186 The request states:

"Noise standards

Clarification of the proposed noise mitigation measures and if the standards apply to:

- *Dwellings at the date the designation is confirmed;*
- *Future dwellings, either zoned for residential purposes at the date the designation is confirmed, or those on land able to be developed for residential purposes."*

¹⁴³ For instance, garage, laundry or walk in wardrobes.

¹⁴⁴ For instance, bathrooms or hallways.

- 187 I have addressed the issue of which dwellings are assessed through the Standard (and the previous Guidelines) in paragraphs 180 to 184 above. To reiterate, in accordance with the Standard, I have assessed all dwellings and other PPFs that existed, or had building consent, at the time of the preparation of the AEE, up to lodgement of the NoR.
- 188 The selected noise mitigation options put forward to the BoI are summarised in Technical Report 15, Sections 7.3.5, 7.4.7, 7.5.10 and 7.6.6.

PROPOSED CONDITIONS

- 189 Designation conditions relating to operational noise are set out in DC.38 to 50 (excepting Condition DC.49 which deals with operational vibration).
- 190 The conditions serve to provide a framework of responding to traffic noise issues from the Project. As discussed throughout my evidence, certainty of mitigation measures is provided through proposed condition DC.39 which references Appendix B of Technical Report 15. Appendix B contains the selected mitigation options put forward by the NZTA on the advice of myself and the rest of the Project team, including bunds, barriers and road surface materials, where these differ from the Do-minimum option. In addition, Appendix B contains all buildings assessed in accordance with the Standard and their respective noise criteria categories.¹⁴⁵
- 191 Condition DC.40 deals with the possibility that the mitigation measures prescribed for the Project may need revision during the detailed design phase. The requirements are set out so that, as long as the same noise criteria category is met, i.e. that noise levels are within a similar range to those calculated, the changed mitigation option can be implemented. However, where there is a potential change to a less stringent, i.e. louder, noise criteria category, then KCDC would be provided with the relevant information similar to that provided in Technical Report 15, Appendix C. This would enable KCDC to evaluate the changed mitigation option and approve it if it was consistent with the BPO.
- 192 Condition DC.41 reinforces the requirement that the prescribed mitigation measures shall be installed, and that this shall occur prior to the opening of the road.
- 193 I note that Conditions DC.42 to 47 relate to dwellings where noise criteria Categories A and B cannot be practicably achieved. My

¹⁴⁵ Category A buildings are shown coloured green, Category B buildings are shown coloured yellow and Category C buildings would be shown coloured red (however no buildings in this Project fall under this Category, with the implementation of the recommended mitigation options).

assessment of the selected mitigation options shows that no such dwellings exist for this Project. However, should consent be granted to the Project but different mitigation options to those selected be chosen by the BoI, or approved under Condition DC.40 following detailed design, this may change. Therefore, I consider that setting out the process for how to deal with any such dwellings is appropriate.

- 194 I consider that Condition DC.42 should reference the Standard in order to avoid doubt as to the applicability of the internal noise criterion, as follows (new words shown in bold):¹⁴⁶

*"Prior to construction of the Project, a suitably qualified acoustics specialist shall identify those PPFs which, following implementation of all the structural mitigation measures included in the Detailed Mitigation Options, are not in Noise Criteria Categories A or B and where Building-modification Mitigation **in accordance with NZS 6806:2010** may be required to achieve 40 dB $L_{Aeq(24h)}$ inside habitable spaces ("Category C Buildings")."*

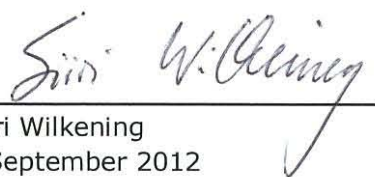
- 195 I consider it important that Condition DC.48 requires that to the extent practicable mitigation measures are kept in working order so that noise reducing capabilities are retained, e.g. that no gaps open up in barriers and that the road surface is maintained to an appropriate standard.
- 196 I note that the reference of drawings in proposed condition DC.40 is incorrect. This condition should reference drawing numbers EN-NV-001 to EN-NV-012 as these are the figures showing the selected mitigation options.¹⁴⁷ The figures currently referenced (EN-NV-020 to EN-NV-094) show noise level predictions for the Do-minimum circumstance and all mitigation options assessed.

¹⁴⁶ This proposed amendment is included in **Annexure E**.

¹⁴⁷ Technical Report Appendices, Report 15, Volume 5, Appendix 15.B. This has been corrected in **Annexure E**.

CONCLUSIONS

- 197 Overall, I consider that with the implementation of the selected mitigation options the Project can be operated to achieve appropriate noise levels. The selected mitigation options, which are proposed to the BoI, were determined through an integrated approach from all relevant Project disciplines, and represent, in my opinion, the BPO for mitigation.

A handwritten signature in cursive script, reading "Siiri Wilkening". The signature is written in black ink and is positioned above a horizontal line.

Siiri Wilkening
4 September 2012