

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 Project

applicant: **NZ Transport Agency**
Requiring Authority

Statement of evidence of **Dr David Black** (Public Health) for the NZ Transport Agency

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REFERENCE: John Hassan (john.hassan@chapmantripp.com)
Suzanne Janissen (suzanne.janissen@chapmantripp.com)

Chapman Tripp
T: +64 4 499 5999
F: +64 4 472 7111

10 Customhouse Quay
PO Box 993, Wellington 6140
New Zealand

www.chapmantripp.com
Auckland, Wellington,
Christchurch



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STATEMENT OF EVIDENCE OF DR DAVID BLACK FOR THE NZ TRANSPORT AGENCY

QUALIFICATIONS AND EXPERIENCE

- 1 My name is Dr David Russell Black.
- 2 I am a medical specialist qualified in Environmental and Occupational Medicine. I am a vocationally registered specialist recognised by the New Zealand Medical Council. In 1981, I completed my medical degree at the University of Auckland (*MBChB*). I have Fellowship of the Faculty of Occupational and Environmental Medicine of the Royal Australasian College of Physicians, admitted in 1995 by examination (*FAFOEM of the RACP*). In 2010, I was awarded the higher medical degree of Doctor of Medicine (*MD*) by the University of Auckland on the basis of academic work in Environmental Medicine. I am an active Member of the Royal Society of New Zealand (*MRSNZ*). I am currently practising Environmental Medicine, based at Auckland Medical Specialists in Gillies Avenue, Auckland.
- 3 I have been working as an academic at the University of Auckland since 1990. I currently hold the position of Honorary Senior Lecturer in Environmental Medicine at the School of Population Health of the Faculty of Medical and Health Sciences at the University of Auckland. Previously I have held the position of Senior Lecturer in Occupational Medicine in Auckland and have been responsible for postgraduate teaching in this area.
- 4 Prior to this, I was an academic at the University of Otago from 1986. Between 1989 and 1997, I was employed by Air New Zealand Limited, firstly as their Regional Medical Officer (Northern) and then as Chief Medical Officer. I had constant involvement in environmental health matters during my 8 years work with that company. Since that time, my main academic interests have been in environmental medicine.
- 5 I remain an active, fully registered specialist medical practitioner and have given expert evidence in Occupational and Environmental Medicine before the Environment Court and similar courts in Australia. I presented expert evidence for the NZ Transport Agency (*the NZTA*) before the Board of Inquiry (*BoI*) on the Waterview motorway project in Auckland.
- 6 I have experience with standards setting with the World Health Organisation (*WHO*), Standards New Zealand (*SNZ*) and Standards Australia (*SA*), as well as other international organisations such as the Institute of Electrical and Electronic Engineers (*IEEE*) and the Australasian Radiation Protection and Nuclear Safety Agency (*ARPANSA*) in environmental exposure standards. I am a named

contributor in a number of environmental exposure standards published by these organisations and which are widely relied on. I am currently the President of the international Bioelectromagnetic Society. I have been a member of the board for many years, was elected Vice President in 2011 and took over as President in June of this year.

- 7 I have extensive experience extending over two decades of assessment and assistance with issues of public concern, particularly regarding actual or perceived physical hazards in areas including radio transmitters and mobile phones, electricity transmission lines and substations, wind turbines, airport noise and community noise. I also have significant experience in the health effects of noise, including working on the Paraparaumu Airport expansion, the Queenstown Airport designation alteration, and the Cromwell Motorsport Park. I also have experience with assessing health related water quality effects, including several assessments on the public health risk of using treated wastewater for land irrigation. The latter included an assessment of the potential for health effects due to contamination of surface water, bores, wells and aquifers.
- 8 I have given expert evidence to the Environment Court in all of these areas. In all these matters my approach is that of an evidence based environmental physician, taking note of both New Zealand statutory requirements and evolving research, in particular publications of the WHO. Whilst I have at times undertaken and published research I do not regard myself as a researcher, but rather as a practitioner of Environmental and Public Health Medicine. In this regard I hold the highest medical qualifications of my University (*MD*) and of my College (*FAFOEM of the RACP*).
- 9 My evidence is given in support of the Notice of Requirement (*NoR*) and applications for resource consent lodged with the Environmental Protection Authority (*EPA*) by the NZTA for the construction, maintenance and operation of the Mackays to Peka Peka Expressway Project (*the Project*).
- 10 I am familiar with the area that the Project covers and the State Highway and local roading network in the vicinity of the Project. I undertook a site visit of the Project area on 28 August 2012.
- 11 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

12 My evidence will deal with the following:

12.1 An Executive Summary;

12.2 Background and Role;

12.3 Overview of Health Related Issues;

12.4 Response to Submissions; and

12.5 Conclusion.

EXECUTIVE SUMMARY

13 I have been retained by the NZTA specifically to address the potential public health effects of the Project, given my experience in environmental medicine. My approach is governed by my training and background as a medical specialist.

14 I have read the Project's application documents lodged by the NZTA with the EPA, paying particular attention to the assessments of and potential for air quality effects, soil and water quality effects, lighting effects, auditory effects and non-audible vibration, including infrasound. I have considered the draft evidence of other expert witnesses in these disciplines.

15 I have also read submissions lodged on the Project which raise public health issues (and these are addressed later in my evidence).

16 I have considered areas which could impact on public health generally, or the health of particular residents in the area traversed by the new Expressway, and have investigated these matters in more detail, having regard to the expert evidence provided by others, to whom I refer where appropriate.

Air Quality Effects

17 During the Project's construction phase, there will be some nuisance dust and some construction traffic machine exhaust, not present in the current environment. However, these can be appropriately mitigated and in my opinion, adequate procedures are in place to ensure this is achieved.

18 Regarding air quality during the operational phase, I have reviewed the evidence of **Ms Camilla Borger** and I have considered the changes to the local traffic environment which will result in traffic traversing the proposed Expressway, instead of the existing State Highway 1 (SH1). In my opinion, the net effect of this change is likely to be, if anything, a positive benefit to public health.

Soil and Water Quality Effects

- 19 I have considered whether there are any potential adverse health effects from soil and water contamination, particularly regarding the contaminated soil sites. The risk of this would be greatest during the construction phase and it has been adequately assessed and any adverse effects will be mitigated. Satisfactory arrangements have been made for storm-water disposal during the operational phase and so none of these matters raise any issues of concern with regard to public health.

Auditory Effects

- 20 There will be noise during the construction phase. This matter has been thoroughly considered by **Ms Siiri Wilkening**, and detailed proposals for mitigation are outlined, including the preparation of general, and site specific, noise management plans.
- 21 I believe that general compliance¹ with the relevant recommended criteria in the New Zealand Standard² and the mitigation as proposed by **Ms Wilkening** will eliminate any risks associated with health effects of construction noise. Regarding potential sleep disturbance, general compliance will allow some sleep disturbance as a result of the Project, but this will not be of durations significant enough to cause negative effects on health.
- 22 During the operational phase, noise levels will be acceptable. **Ms Wilkening** has proposed strategies and mitigation measures to ensure compliance with the 2010 New Zealand Noise Standard,³ using an approach of Best Practicable Options (*BPO*). In my opinion this approach is entirely acceptable and will minimise any risk of adverse health effects arising from noise.
- 23 In my opinion, the approach taken as outlined in **Ms Wilkening's** evidence does represent best practice and is entirely acceptable. Further, I note that the relevant New Zealand standards for construction noise⁴ and road noise⁵ which have been used here are the only relevant standards documents in this area (particularly the latter which is very up-to-date), and do in themselves provide an assurance of best practice.

¹ **Ms Wilkening's** evidence is that, in particular circumstances, noise levels will exceed the recommended criteria in the New Zealand Standard (NZS 6803:1999), even with the implementation of recommended mitigation measures. In those circumstances, various management measures will be employed on a case-by-case basis, including through the use of Site Specific Site Specific Construction Noise Management Plans.

² New Zealand Standard NZS 6803:1999 "Acoustics-Construction Noise."

³ New Zealand Standard NZS6806:2010 "Acoustics – Road traffic noise - New and Altered Roads".

⁴ New Zealand Standard NZS 6803:1999 "Acoustics-Construction Noise."

⁵ New Zealand Standard NZS 6806:2010 "Acoustics – Road traffic noise - New and Altered Roads."

Vibration Effects

- 24 Vibration effects will occur mostly during construction and to a lesser extent during operation. However, none of these are of sufficient magnitude to conceivably cause any adverse health effects.

Lighting Effects (Sleep Disturbance)

- 25 Lighting effects during construction and arising from the operation of the new Expressway could potentially cause sleep disruption, however this is easily mitigated and cannot be regarded as a potential concern with regard to public health.

Mental Health and Perception of Risk

- 26 Misconceptions and misunderstandings of risk are often a major cause of distress in any large construction project and the psychological mechanisms by which these occur are well understood and best mitigated by provision of full and complete information, investigation of special cases and careful communication of accurate and understandable information. Considerable efforts have already been made by the NZTA in this regard. These initiatives should continue throughout the Project and appropriate conditions are proposed to ensure this.

Submissions

- 27 I have read all of the submissions provided to me on public health issues and find that most of these are genuine concerns, which are reasonably raised. However, in the majority of cases, the concerns raised are already dealt with sufficiently in the Project's design (including the Project's conditions) and I have answered these in my evidence. I have discussed all of the remaining concerns and am satisfied that none of the potential matters raised by submitters are an issue for public health.

BACKGROUND AND ROLE

- 28 I have been retained by the NZTA specifically to address the potential public health effects of the Project, given my experience in environmental medicine. My approach is governed by my training and background and my responsibility as a medical specialist.
- 29 I have read the application documents lodged by the NZTA with the EPA, paying particular attention to the assessments of and potential for air quality effects, soil and water quality effects, lighting effects, social effects, noise effects and vibration effects. I have considered the draft evidence of other witnesses presenting evidence in these disciplines.
- 30 I have also read submissions lodged on the Project which raise public health issues (and these are addressed later in my evidence).

- 31 I visited the Project area on 28 August 2012 in the company of a planner from Beca, who has been working on the Project. During this visit I familiarised myself with the Project route and the neighbourhood around the planned Expressway. I also familiarised myself with the existing stretch of SH1.
- 32 I visited particular properties which had been referred to in submissions, including the Paraparaumu Medical Centre and the Metlifecare Kāpiti Retirement Village. I have also searched the Ministry of Health (*MoH*) Database and identified registered sources of potable water within or near to the Project's construction zone.

OVERVIEW OF HEALTH RELATED ISSUES

Introduction

- 33 This section of my evidence outlines and addresses issues relating to the Project that are potentially relevant to public health considerations, namely:
- 33.1 Air quality effects;
 - 33.2 Soil and water quality effects;
 - 33.3 Noise effects;
 - 33.4 Vibration effects;
 - 33.5 Lighting effects (sleep disruption); and
 - 33.6 Mental health and perception of risk.
- 34 Each of these issues has been separately investigated for the Project and reported on in the Assessment of Environmental Effects (*AEE*), lodged with the EPA. I have read these technical reports as well as the expert evidence of **Ms Borger** (air quality effects), **Dr Kerry Laing** (land and groundwater contamination), **Ms Ann Williams** (Groundwater), **Ms Wilkening** (Noise), **Mr James Whitlock** (vibration), **Mr Keith Gibson** (Lighting), **Ms Jane Black** (consultation) and **Ms Julie Meade Rose** (Social). I have then assessed the potential health effects based on the conclusions of these investigations as well as my own knowledge in these fields.
- Air Quality Effects**
- 35 As outlined later in my evidence, a number of submitters have raised the issue of air quality, which is a reasonable concern and a matter which has already been identified and discussed in some detail in the evidence of **Ms Borger**. There are two main sources of potential air contamination from this Project; firstly during the construction phase (from construction dust and construction

vehicles) and secondly, during the operation of the Expressway (from the operation of vehicles).

Construction Phase

- 36 There will be dust and some potential discharge of contaminants during the construction phase. Dust, or airborne soil, has the potential to cause some respiratory irritation, particularly in individuals with pre-existing respiratory problems. Eye irritation is also possible.
- 37 Both of these effects, if they occur, would be acute, self-limiting (ending when exposure ends) and readily reversible. Any on-going potential for exposure could be readily mitigated using simple respiratory or eye protection.
- 38 At some sites along the Expressway which have been identified as contaminated (i.e. 55 Rata Road, Kāpiti Road intersection and 124-154 Te Moana Road), there is also the potential for construction to produce more hazardous dust, containing pollutants such as arsenic and polycyclic aromatic hydrocarbons. This is detailed in the evidences of **Dr Laing** and **Ms Borger**. Such contaminated dust has greater potential for health effects, depending on the nature of the contaminant. These materials need to be contained at the source.
- 39 However, none of the dust issues for this Project are significantly different to any other project of a similar magnitude, although I do note that in much of the Project area the soil has a high sand content, which has a higher potential to generate dust (discussed in Technical Report 23, Assessment of Land and Groundwater Contamination Effects). However, in saying this, I am confident that the conditions and mitigation proposals regarding air contamination during construction are adequate to prevent sandy dust from having a negative effect on public health. Regarding the contaminated soil, prevention of airborne dirt should be adequate to contain the contaminants and prevent any health effects as a result of air quality.
- 40 In my opinion the implementation of the NZTA's mitigation proposals for air contamination during construction, as described in Technical Report 14 (Assessment of Construction Air Quality Effects), the Construction Air Quality Management Plan (CAQMP) and the evidence of **Ms Borger**, will eliminate any significant or even detectable effect on the health of adjacent communities.

Operational Phase

- 41 With regard to air contamination from operation of the Expressway, the issues are substantially different. Air contamination from roads arises principally from the exhausted products of combustion of hydrocarbon fuels, as well as a significant and often detectable level

of unburned volatile fuels, some of which arise from evaporative loss from fuel tanks. Both of these are matters of legitimate health concern and have been subject to substantial research (noted in Reference [1]).

42 The pollutants of most concern in terms of health effects are carbon monoxide (CO), nitrogen dioxide (NO₂), respirable fine particles (PM₁₀ and PM_{2.5}) and benzene. Levels of these pollutants are regulated by the following Air Quality Standards and Guidelines:

42.1 New Zealand National Environmental Standards (AQNES);

42.2 New Zealand Ambient Air Quality Guidelines (NZAAQG); and

42.3 Regional Air Quality Targets.

43 The purpose of these air quality standards and guidelines is to assess the potential for adverse health effects from air pollutants and to provide a degree of protection to minimise any such effects. Unlike some standards, such as those for noise, they are not designed to completely eliminate any potential health effect on all members of the normal population distribution. This would not be possible or realistic, short of significant changes to the quality of New Zealand's vehicle fleet, the majority of which do not receive any regular assessment with regards to emissions. The current air quality standards and guidelines instead set achievable limits to best minimise the effects on most people, given the exposure environment in New Zealand. This approach is designed to provide substantial protection to all members of New Zealand society, including those seen as "vulnerable", such as children and the elderly. Over time, together with improvements in vehicle and fuel technology, ongoing improvements in air quality are expected [1].

44 Products of combustion can be harmful to health and probably contribute substantially to respiratory disease in some parts of New Zealand. In my opinion, motor vehicle emissions are a likely cause of some premature mortality each year in New Zealand.

45 As a result of this Project, some harmful products of combustion will be generated on the Expressway. However, as **Ms Borger** explains, these emissions will comply with the relevant standards and guidelines. In addition to this, the presence of vehicle emissions in the community is an inevitable consequence of any kind of motor vehicle running and it is my opinion that overall exposure to the community will be no greater than what is currently produced as a result of traffic movement on the existing section of SH1 and on the local arterial roads.

46 It is my opinion that the net effect of the Project on local emission levels will be beneficial. Motor vehicle emissions are much more

pronounced when engines are operating at variable speeds and stopping and starting. The most efficient combustion in most internal combustion engines occurs during sustained cruising, with the engine running drawing a constant amount of fuel at several thousand revolutions per minute. This condition is generally achieved with motorway or expressway running.

- 47 On this basis, from an equivalent distance travelled perspective, motorway or expressway running is environmentally far preferable to suburban running. With the current roading environment in the Kāpiti region, where SH1 cuts through the middle of many commercial centres, with traffic lights and slower speed zones, and with a large number of side roads joining to and crossing over the highway, it is clear that there is presently a lot of starting, stopping and speed variations. Shifting much of the current SH1 traffic to a dedicated expressway (such as is proposed) where traffic flow and speeds are more constant and local roads can be bypassed - reducing the number of intersections, particularly those involving rapid acceleration to match high speeds - will, in my opinion lead to a decrease in the overall emissions produced in the Kāpiti region and have an overall benefit for public health.
- 48 Nowhere in the surrounding Kāpiti community will the levels of exhaust gases or their constituents exceed the safe limits which are widely accepted as providing protection from health effects. The same cannot be said of many other New Zealand large city roads, where a "canyoning" effect can (and does in Auckland, not infrequently), produce unacceptable levels of exposure.
- 49 However, there are a number of residential dwellings which will lie within 200 metres of the Expressway, mostly in Sectors 1-3 (between Raumati South and Otaihanga/Waikanae), with some dwellings lying within 50 m of the proposed route.⁶ Construction of the Expressway would be expected to expose these dwellings to potentially greater levels of vehicle pollution, than they currently experience as a result of SH1. This might lead to a small increase in respiratory health issues over time in a small number of individuals who are already susceptible, although this may not occur. As I have already discussed, while the emissions in the immediate vicinity of the new Expressway may increase, the overall emissions in the community should not, as a result of more efficient engine operation in the area. The net effect is more likely to be an improvement in public health.

⁶ 200 m is the average distance from this type of roadway in which increases in ground level concentrations of motor vehicle related air pollutants should be detected above the typical urban background. This is described in more detail in Technical Report 13 (Assessment of Operational Air Quality Effects) and in the evidence of **Ms Borger**.

- 50 I note that this proximity is not unusual in New Zealand. Heavily used motorways have been positioned alongside existing residential areas and new residential dwellings and public facilities are still often built within 200 metres of existing motorways. However, in such cases the potential for effects of the motorway, (particularly air discharges from internal combustion engines and noise, from both engines and road traction) need to be taken into account. In both cases, as a general rule, effects of a road intended for travel at a continuous speed (such as the proposed Expressway) are significantly less than roads where starting and stopping, accelerating and braking is required (such as the current SH1). These features of vehicle operation are noisy and do not optimise fuel consumption and exhaust quality. Therefore, it is my opinion that the effect of moving the traffic flow closer to some residences (through the development of the Project) will be countered by the overall improvements in fuel consumption and exhaust quality produced by taking cars off SH1 and running them more efficiently on the proposed Expressway.
- 51 Regarding sensitive receivers, there are no schools, preschools or hospitals within 200 metres of the proposed Expressway. However, some parts of a local retirement village (Metlifecare Kāpiti Retirement Village) lie within 200 metres of the proposed route. There is also an educational camp and a few parks within 200 metres of the route, one of which includes a children's playground, which would be located within 100 metres of the Expressway.
- 52 The extent to which a retirement village is a sensitive receiver needs to be assessed on an individual case basis. However, I note that in this instance, the retirement village was built on land adjacent to the Western Link Road designation (*WLR*), which is now going to be used for the Expressway. The land was already designated when the retirement village was constructed, and in my opinion, the decision to construct at this location was, and remains, sound. There is plenty of opportunity for mitigation of effects. The elderly may be considered more sensitive, but are still generally within the normal population, and as such, standard mitigation measures to ensure compliance with the appropriate standards should be adequate to protect against health effects.
- 53 Regarding educational and children's facilities, these are not necessarily inappropriate within this zone as they are frequently found close to busy urban roads from which effects are likely to be greater.
- Community Exposure Assessment**
- 54 I note that **Ms Borger** is in the process of preparing a community exposure assessment, in response to the BoI's section 92 request. I understand that this community exposure assessment will look at the average change in PM₁₀ concentrations across the population

exposed. I note that I may have further comments to offer to the BoI on this issue, following the completion of that community exposure assessment.

Conclusions

- 55 It is my opinion that the recommendations and proposed conditions contained in the evidence of **Ms Berger** and the CAQMP will protect against public health effects of air contamination during construction.
- 56 Once construction is complete and the motorway operational, the Expressway will comply with the appropriate Air Quality Standards and the overall effect on the health of the Kāpiti community as a result of car emissions should improve due to the increased efficiency of passage of cars through their local environment.

Soil and water quality effects

Construction Phase

- 57 During the construction phase of the Project, there will be human activity and earthmoving in areas previously undisturbed. This does have the potential to cause transient changes in water quality, which will need to be controlled. There is also the potential for spread of soil-borne contaminants through water or dust.
- 58 I have read the evidence of **Dr Laing** and Technical Report 23 – Assessment of Land and Groundwater Contamination. I have also read the evidence of **Ms Williams** on groundwater effects. **Dr Laing's** evidence describes the results of investigations into current levels of contaminants in and around the proposed Expressway route, which show the presence of contaminants at some sites. He then discusses the potential effects of this and mitigation measures (where needed).
- 59 I note that issues relating to water and soil quality have been addressed by the NZTA through the establishment of a number of management plans. These include the proposed:
- 59.1 Construction Environmental Management Plan (*CEMP*), which details programmes for monitoring water effects and provides measures to mitigate potential effects;⁷
- 59.2 Contaminated Soils and Groundwater Management Plan (*CSGMP*) (which includes preparation of a Construction Health and Safety Plan), which highlights recommended standard procedures for the management of contaminated soil and groundwater;⁸

⁷ Condition G.20.

⁸ Condition G.32.

- 59.3 Contaminated Soils Management Plan (Human Health) (*CSMPHH*), which will identify the approach to the remediation or ongoing management of all sites identified as posing a risk to human health from the disturbance of contaminated soil;⁹ and
- 59.4 Erosion and Sediment Control Plan (*ESCP*) which will mitigate the potential for contamination of public water sources with contaminated soil.¹⁰ These are described in more detail in the evidence of **Dr Laing**.
- 60 One area where water quality could affect public health would be through contamination of personal bores or water takes. Such private takes require a permit from the local council to operate, and if they are to be used for potable water, they are also required to be registered with the MoH on their national Register of Community Drinking Water Supplies in New Zealand [2]. A search of this database shows three registered community water takes in the vicinity of the proposed Expressway. One of these is at the El Rancho Christian Camp, which serves 200 people and has two sources serving several locations. The first is a bore (El Rancho Camp Bore) and the second is a source from the Waikanae River. The other two locations with registered water takes are on Gary Road, which is off Te Kowhai Road, west of the northern end of the Project. One is the Gary Road water supply, serving 25 people, and the other is the Forest Lakes Christian camp with two bores serving 130 people.
- 61 It will be important that the Project does not affect any of these consented surface water takes.
- 62 In the first instance, contamination (which I understand would for the most part be temporary elevation in turbidity caused by sediment mobilisation) should be avoided through the sediment/silt control that is proposed in the CEMP and described in the evidence of **Dr Laing** and **Mr Graeme Ridley**. The assessments take into account groundwater flow effects as discussed by **Ms Williams**. I am confident that these assessments are adequate to predict the potential water-flow and that the methods outlined in the CEMP would be adequate to ensure contamination of water should not occur.
- 63 It is also possible that houses or communities are using unregistered water takes for their own domestic or private use. It is important for the public to understand that this is not permitted and is not safe from a public health point of view (and this is the case irrespective of the Project's development).

⁹ New condition NES.1 (discussed in the evidence of **Dr Laing**).

¹⁰ Condition G.27.

- 64 Technical Report 23, (which is discussed in the evidence of **Dr Laing**) reports on investigations into the issue of effects on shallow bores along the Kāpiti Coast and concludes that there are no shallow boreholes identified as being used as a supply for drinking water. Technical Report 23 and the evidence of **Ms Williams** conclude that, although deep aquifers have been identified in the area, these will not be affected by the Project.

Operational Phase

- 65 Once the Expressway is operational, there will be little risk of effects on waterways or soil. Run-off from the Expressway will be appropriately channelled and drained and is not likely to enter any potential drinking water sources.

Conclusions

- 66 I am confident that the approaches described by **Dr Laing** are adequate to protect the health of both workers (during the construction phase of the Project) and the general public (following the commissioning of the Expressway) from exposure to soil or groundwater contaminants.
- 67 It is my opinion that the recommendations and proposed conditions contained in the evidence of **Dr Laing** will protect against effects of water and soil contamination from a public health perspective. Once construction is complete and the Expressway operational, there should not be any further impact on water or soil quality.

Noise effects

Noise Standards and Guidelines

- 68 Some health authorities (including the WHO) have become interested in the effects of noise on health and wellbeing. In that regard, the WHO has published two relevant documents: the 1999 "Guidelines for Community Noise" [3] and the 2009 "Night Noise Guidelines for Europe" [4]. In producing these guidelines, the WHO used an evidence-based scientific approach to assess the health impacts of community noise. Guidelines were then set for noise levels based on the lowest levels of noise which would have a critical effect on health for the general population. These aim to prevent both social impacts (such as disrupted communication) and health impacts (such as sleep disturbance) for all members of normal society, including more vulnerable groups such as children and the elderly.
- 69 As their names indicate, these WHO documents are guidelines, and are intended to direct relevant authorities, such as Standards New Zealand, when making their own Standards. The WHO guidelines were never intended as standards themselves and are not suitable for this. In fact, some of the thresholds and criteria in WHO guidelines are often aspirational rather than realistic. Furthermore,

they have to be able to be used by a wide variety of communities with differing wealth, resources and infrastructure.

- 70 Having said that, the 1999 report has become a very important baseline reference for many subsequent standards. The 2009 European report was produced with the particular issues of densely populated European countries in mind, a feature of which tends to be buildings with relatively high insulation properties. However, while it is specifically intended for a European audience, it none-the-less serves as a recent update from the 1991 Guidelines for Community Noise and is valuable in that context.
- 71 Local standards, such as those issued by Standards New Zealand, take account of the WHO's work and apply it in the context of local conditions. In any environment, a current local standard should always be preferable over an international guideline and that is the case for this Project. Therefore, above all, I recommend compliance with the relevant New Zealand Standards, as has been proposed here.¹¹ Such compliance is sufficient to protect all members of the normal population¹² against any health effects of noise, including sensitive individuals such as the young or old. I note here that there is often a group of people who are referred to as "hypersensitive" to various environmental agents such as noise. Such individuals are outside of this distribution curve and therefore it is not always feasible to extend general Public Health Standards to protect them.

Construction noise

- 72 Construction noise from the Project is governed by the *New Zealand Standard NZS 6803:1999 "Acoustics-Construction Noise" (NZS 6803:1999)*. The issue of noise during construction has been addressed in the evidence of **Ms Wilkening**.
- 73 In general, the most likely effect of construction noise on health is sleep disturbance. Audible noise will only cause direct health effects if at much higher levels, none of which are predicted for the general public as a result of this Project. For example, for noise-induced hearing loss, a person would need to be exposed to sound levels of more than 85 dBA for 8 hours a day, 40 hours a week. The threshold for acute damage from noise is 140 dB.

¹¹ Although, as noted above, there will be occasions when the noise levels exceed the recommended criteria in NZS 6803:1999. However, general compliance with NZS 6003:1999 is acceptable, as occasional exceedances of this standard will not affect public health.

¹² Represented as a Gaussian or bell-shaped curve. At the most sensitive end of this there will be a few individuals who are unusually sensitive. This is generally, by convention, regarded as 2.5-5% of the population. Nonetheless, such people are part of a normal population.

- 74 **Ms Wilkening's** calculations show that noise from construction will be generally within the levels recommended by NZS 6803:1999; that is, a night-time external noise limit of 45 dB L_{Aeq} in residential dwellings with ambient noise.
- 75 Some exceedances of the recommended criteria in the Standard are predicted. These are particularly associated with the construction of bridges, which will involve night-time works, in order to minimise traffic disruption. Night time works will be required for construction of the Raumati Road, and Kāpiti Road Bridges¹³ (in Sector 2), the Otaihanga Road and Te Moana Road Bridges (in Sector 3) and the Bridge across Ngarara Road and works in Peka Peka Road (in Sector 4). No night-time works are proposed in Sector 1.
- 76 Night time exceedances do have the potential to disrupt sleep, which is recognised by the WHO as a potential cause of negative health effects. However, provided adequate communication with residents is carried out, as proposed by **Ms Wilkening**, such occasional exceedances can be tolerated and will not have a negative impact on public health and wellbeing.
- 77 Some day-time exceedances may also be needed, for example during bridge construction or during heavy earthworks near dwellings. However, these too will be of short duration and, in my opinion, unlikely to impact on public health, provided communication with the public is open and clear.
- 78 I note that in her evidence **Ms Wilkening** discusses noise control and mitigation measures, including the preparation of a Construction Noise and Vibration Management Plan (*CNVMP*) and Site Specific Construction Noise Management Plans, where noise may exceed the recommended criteria in NZS 6803:1999.
- 79 I believe that general compliance with NZS 6803:1999 and the mitigation as proposed by **Ms Wilkening** will eliminate any risks associated with health effects of construction noise impacting on wellbeing.
- 80 Regarding potential sleep disturbance, general compliance will allow some sleep disturbance as a result of the Project, but this will not be of durations significant enough to cause negative effects on health. For negative health effects to occur, sleep disturbance would need to be sustained and ongoing, which will not be the case for any individual residences which might be affected by Project construction noise.

¹³ I note the evidence of **Ms Wilkening** and **Mr Andrew Goldie**, which suggests that night time works associated with the construction of the Mazengarb Road Bridge may be able to be avoided.

- 81 Levels of noise such as this might potentially have a minor amenity effect for a few people, but should not be of wider concern for public health. Occasional exceedances of the recommended criteria in the Standard (as will occur as part of this Project) should not have an effect on public health.

Operational Noise

- 82 Operational noise from the Project is governed by the *New Zealand Standard NZS 6806:2010 "Acoustics – Road traffic noise - New and Altered Roads"* (NZS 6806:2010). The issue of noise during operation of the Expressway has also been addressed in the evidence of **Ms Wilkening**.
- 83 As with construction, the main consideration for assessing the potential health effects from operational noise, is sleep disturbance.
- 84 During operation of the Expressway, there will be some noise from traffic. However, this will be similar to levels experienced near other highways in the Wellington area and of an acceptable level with regard to public health. Modern vehicles and contemporary road surfaces have reduced road noise substantially, although traffic intensity has to some extent negated the net benefit of that.
- 85 Road noise is an issue which has been traversed in some detail by the WHO in their Guidelines for Community Noise and in the Night Noise Guidelines for Europe (referred to above). This has flowed into many standards throughout the world and the general principles of this guideline have been adopted and accepted in New Zealand. In the development of NZS 6806:2010, Standards New Zealand have taken into account the principles of the WHO Guidelines, applying them in a New Zealand setting. More detail on NZS 6806:2010 can be found in the evidence of **Ms Wilkening**.
- 86 **Ms Wilkening's** calculations show that, with appropriate mitigation, the level of noise from operation will be within the criteria specified in NZS 6806:2010 for a new road with daily traffic movements of between 2,000-75,000; that is 57 dB $L_{Aeq(24h)}$ and 64 dB $L_{Aeq(24h)}$ for outside noise (primary and secondary) and 40 dB $L_{Aeq(24h)}$ for internal noise. **Ms Wilkening** has also assessed some properties in relation to the criteria specified in NZS 6806:2010 for an altered road, that is, 64 dB $L_{Aeq(24h)}$ and 67 dB $L_{Aeq(24h)}$ for outside noise (primary and secondary for Category A and Category B respectively) and 40 dB $L_{Aeq(24h)}$ for internal noise. Her assessment confirms that the relevant criteria will also be met for those properties.
- 87 Mitigation will include the use of noise barriers and bunds alongside the Expressway corridor, and the use of low-noise generating road surface materials (i.e. OGPA). In her evidence, **Ms Wilkening** states that with appropriate mitigation, most dwellings affected by the Project will fall within the limits allowed by Category A (the

highest category with the strictest limits), with a few dwellings in Category B, and none in Category C.

- 88 Therefore, **Ms Wilkening's** noise assessments show that noise from operation of the Expressway will be within the levels allowed by NZS 6806:2010 and within the recommended limits of the WHO.
- 89 I note that Ms Wilkening has adopted a BPO approach to mitigate operational noise effects and ensure strict compliance with NZS 6806:2010. I agree with this and in my opinion this approach is entirely acceptable to at least minimise and probably eliminate any risk of adverse health effects (through sleep disturbance) arising from noise.

Conclusions

- 90 Overall, **Ms Wilkening's** noise assessments show that, with appropriate mitigation measures, noise from both construction and operation of the Expressway will generally be within the levels allowed by the relevant New Zealand Standards¹⁴ and within the recommended limits of the WHO.
- 91 I do not consider the effects of noise from the Project will be an issue for public health, provided that the Standards are generally complied with (as is proposed here) and appropriate mitigation has been attended to, as recommended by **Ms Wilkening** in her evidence.

Vibration effects

- 92 Vibration can occur through air conduction at frequencies below those normally heard by the human ear, (sometimes called infrasound in air) or by conduction through the ground. Vibration can be annoying and therefore have a negative effect on amenity, but does not have a direct health effect until it reaches very high levels.
- 93 For example, diseases such as Hand Arm Vibration Syndrome (*HAVS*) or Whole Body Vibration (*WBV*) can be caused by direct localised exposure to very high magnitudes of vibration, such as can be experienced by a construction worker operating a jack-hammer. Another vibration-related disease is vibro-acoustic disease (*VAD*). *VAD* is a multi-systemic entity caused by occupational or chronic exposure to large pressure amplitude low frequency noise (greater than 90 dB sound pressure level (SPL) at frequencies under 500 Hz) [5].
- 94 Circumstances in which harm can arise from subsonic vibration are altogether different, with the order of magnitude of vibration levels

¹⁴ As noted above, some exceedance of the recommended criteria in NZS 6003:1999 is expected, and is acceptable, in terms of public health.

being much greater than those which the general public are transiently exposed to from nearby construction works. Such maladies have been described in people confined to adverse industrial environments for long periods (such as in constantly airborne military aircraft). These conditions arise in altogether different circumstances and are irrelevant to any conceivable or possible health effects of this Project.

- 95 There will be vibration associated with the Project, particularly when hard ground is encountered during construction of structures, such as bridge pilings. However the amplitude of such vibration will be such that, although it may be sensed or felt by residents, it will not be harmful. It will also be transient.
- 96 Once the Expressway is operating, noise energy from traffic will include a subsonic element. However, this will be of a similar magnitude to low frequency audible sound and will be of a level which is already occurring (and is acceptable) adjacent to other roads in the area. Levels of this nature are readily accepted by communities throughout New Zealand, without any adverse health effects.
- 97 The issue of vibration (including the preparation of the CNVMP, and the proposed construction vibration criteria) is discussed further in the evidence of **Mr Whitlock**.

Conclusions

- 98 I do not consider the effects of vibrations from the Project will be an issue for public health. Any vibration produced during construction or operation of the Expressway will not be of a magnitude which could conceivably cause any health effects.

Lighting effects (sleep disruption)

- 99 There may be changes in sources of artificial light as a result of both the construction phase and the operation of the Project. These however, are not an inevitable cause of sleep disruption. Light travels in straight paths and it is generally easily screened. Therefore, there is no need to regard such an effect as more than a minor nuisance which is easily mitigated.
- 100 Lighting effects are discussed further in the evidence of **Mr Gibson**, which shows that light from the Project will meet the requirements of the relevant standards (the Lighting Standard, the Spill Light and Glare Standard), as well as the District Plan in regards to obtrusive light control.

Conclusions

- 101 In my opinion, the above standards are adequate to address public health issues. I do not consider the effects of light from the Project

will be an issue for public health, either during construction or operation of the Expressway.

Mental health and perception of risk

102 Whenever a new activity as significant as a roading project occurs in the community, many people become concerned over the potential risk of the activity. This subtle perception of risk depends on a number of factors;

102.1 The perceived magnitude of the risk;

102.2 Who is taking the risk; and

102.3 Who benefits from the activity.

103 Many activities also have the potential to create "outrage" which has been described in the literature as the "outrage factor" [6].

104 This anxiety over new developments often centres on a fear of the unknown effects of the project, whether they are health effects, financial effects or amenity and lifestyle effects. However, in my experience, once a project is complete and the development is in place and the associated uncertainty is resolved, most people adapt to the change in their environment and accept the presence of the development. It is my opinion that this will be the case for the majority of the Kāpiti Coast community, with respect to the Expressway. Once the Expressway is operational and the public's concern regarding health and disruption effects are alleviated, it is likely that the Expressway will become an accepted part of the environment in the area. I believe it is likely that as the Project proceeds, there will be community satisfaction with the completed result, which will also alleviate concerns. I do not anticipate that the mental health of the community will be negatively affected.

105 However, on some occasions, some people can become highly sensitised to an activity. These individuals can become distressed following a cue to an activity (such as noise or vibration or visual cue) which triggers their awareness of the new activity and leads to escalating concern about harm. Anxiety builds and any slight cue to the presence of an activity becomes sufficient to trigger anxiety and distress. Physiological reactions in response to anxiety can then occur, such as release of catecholamine hormones and subsequent elevated heart rate. A cascade of other symptoms of anxiety may then ensue.

106 Such a condition can be regarded as an effect, and can verge on a diagnosable phobia in psychiatric terms. Essentially, the main determinant of such an effect is a person's attitude to an activity. Whether or not the activity disturbs them comes down to how they perceive it in their overall environment. Such conditions can arise

where there are misconceptions about effects of an activity. They are much better to avoid than to have to address by treatment. Misconceptions can be avoided or remedied in the context of this Project by provision of full and complete information, investigation of special cases and careful communication of accurate and understandable information (which I consider is provided for through the proposed conditions, such as through the provision of the Stakeholder and Communications Management Plan).¹⁵

Conclusions

- 107 The matters of communication and conditions relating to management of communication are further addressed in the evidences of **Ms Black** and **Ms Meade Rose**. I am satisfied that the NZTA is taking the appropriate approach to best ensure clear and open communication with the public, which should minimise anxiety during the Project. This should minimise the risk of sensitisation to the Project and subsequent mental health effects following commissioning of the Expressway. I believe most of the community will adapt to the change in their environment and will not experience any long-term mental health effects.

RESPONSE TO SUBMISSIONS

- 108 I have read submissions lodged on the Project that raise health concerns or related issues relevant to my area of expertise. In this section of my evidence, I will address these submissions. I have not responded to all of the submissions individually, but have endeavoured to respond to all of the issues raised by submitters. Where multiple submissions raise the same issue, I have grouped my response by issue.

Air Quality Effects

- 109 Several submitters are concerned about the potential for health effects due to changes in air quality, particularly regarding vehicle emissions.¹⁶ Several of these submitters are particularly concerned about the respiratory health of young children or the elderly.

¹⁵ DC.13.

¹⁶ Including the submissions of D and D Waterson (Submitter No. 267), Dr Van Riessen (Submitter No. 265), R Blok (Submitter No. 268), J Scrimshaw (Submitter No. 304), N Saxby and B Mountier (Submitter No. 327), S Richardson (Submitter No 333), J and J Kelly (Submitter No. 339), (Submitter No. 348), M Sherley (Submitter NO. 350), J George (Submitter No. 376), M Anderson, (Submitter No. 378), G McCall (Submitter No. 390), Kapanui School (Submitter No. 415), A Britton (Submitter No. 423), K Whibley (Submitter No. 482), Smart Transport Network (Submitter No. 484), Implementation Group of KCDC Advisory on CWB (Submitter No. 485), D Kieboom (Submitter No. 494), S Edbrooke (Submitter 517), G Allen (Submitter No. 523), L Allen (Submitter No. 524), K Pivac (Submitter No. 536), Highway Occupants Group (Submitter No. 542), K Taylor (Submitter No. 552), S Staniland (Submitter No. 577), M McNaughton (Submitter No. 583), K Nauta and D Jones (Submitter No. 600), Metlifecare Kāpiti (Submitter No. 608), N Easthope (Submitter No. 621), G

Effects of Diesel and Carbon Monoxide

- 110 Many of the submitters are particularly concerned about the health effects of diesel exhaust,¹⁷ citing the WHO as calling diesel exhaust a known carcinogen. The submission from *Dr Kieboom* states diesel exposure can lead to “*an increase in lung cancer, bladder cancer, asthma and chronic bronchitis*”.
- 111 Diesel exhaust is an established cause of cancer. It has been categorised as such by the International Agency for Research on Cancer. The predominant effect of this occurs along roads which are contained airspaces, such as in a canyon or a city street, particularly in environments where meteorological conditions do not allow thermally driven atmospheric air exchange. None of these conditions exist in this area; such effects would be more likely to occur in suburban Wellington or Auckland, and probably do.
- 112 Some submitters¹⁸ are concerned specifically about carbon monoxide and the risk of inhalation of this causing heart arrhythmia. Submitters *N Alexander and R Neilson* refer to a publication in the American Journal of Respiratory and Critical Care Medicine about a study by the British Heart Foundation [7], which they say showed that even low levels of carbon monoxide can disrupt heart rhythms and cause death. Ms Neilson has a damaged heart valve from rheumatic fever as a child and is concerned about this.
- 113 Carbon monoxide levels, even immediately adjacent to a free flowing Expressway and open space, do not approach the levels of hazard referred to by the submitters. **Ms Borger’s** evidence shows that carbon monoxide levels are considerably less than the relevant standards. Such levels are well below the levels at which such effects can occur.

Effects on Cancer Patients

- 114 One submitter¹⁹ is particularly concerned about vehicle exhaust, as she has previously had treatment for cancer and is worried that airborne pollutants from cars will lead to her cancer returning.
- 115 The established carcinogenicity of diesel exhaust does not indicate that it is a promoter of existing cancer, it is an independent cause of

Cherrill (Submitter No. 631), P Cherrill, (Submitter No. 632), B Karl and R Usmar (Submitter No. 660) and Dr M O’Sullivan (Submitter No. 675).

¹⁷ Including the submissions of A Cherrington (Submitter No. 356), J George (Submitter No. 376), Implementation Group of KCDC Advisory on CWB (Submitter No. 485), M Eillis (Submitter No. 534), R Kieboom (Submitter No. 547), K Nauta and D Jones (Submitter No. 600), K Saint (Submitter No. 607), N Alexander and R Neilson (Submitter No. 619) and E Hinkley (Submitter No. 673).

¹⁸ Including the submissions of S Houston and R Lord (Submitter No. 566) and N Alexander and R Neilson (Submitter No. 619).

¹⁹ M Starke (Submitter No. 690).

some cancers and should not affect the natural history of existing disease.

Effects on Young and Old

- 116 The submission from *Dr Van Riessen*, a local GP, talks of “*fine dust particles*” and the CO₂ from vehicle exhaust giving an immediate increased risk to asthma and allergies in children, Chronic Obstructive Pulmonary Disease (*COPD*), lung cancer, cardiovascular disease and heart attacks in adults and an increase in adult mortality rate.²⁰ *Ms Sherley’s* submission is particularly concerned about Kāpiti’s elderly population, stating “*emissions from petrol and diesel can change vascular function*” and that this is particularly bad for the elderly as “*these changes can cause high blood pressure, cardiac disease, degenerative brain disease causing Alzheimer’s and decreased cognitive (dementia) and motor function*”.²¹ *Mr Britton* is concerned that the Project could cause an “*increase in asthma in children and breathing difficulties in older people, and other related health problems*”.²²
- 117 The matters raised by *Dr Van Riessen*, *Ms Shirley* and *Mr Britton* are valid for motor vehicle fumes in general, but not necessarily for the proposed Expressway. Continuous improvement in motor vehicle design and the control of exhaust is improving the health impact of vehicles; however, this still remains a problem in New Zealand, where there is relatively light control of these matters. These concerns are not so much an issue for the construction of this Project, as for the age and condition of the vehicle fleet generally. Such issues are of greater concern in an urban and suburban community where stopping, starting and acceleration is a feature of vehicle operation. As already discussed, this Project will lead to less inefficient fuel consumption and overall less emissions in the Kāpiti area. This will have resulting benefits overall for public health.
- 118 The submission from *Dr van Riessen* also asks about the effects of vehicle emissions on the foetus.
- 119 Although the constituents of vehicle emissions could potentially have an effect on an unborn child, much higher levels than occur even in the worst circumstances from vehicle emissions in New Zealand would be required. This is not a valid concern with respect to the construction of this Expressway.

²⁰ Submitter No. 265.

²¹ Submitter No. 350.

²² Submitter No. 423.

Distances of Effects on Air

- 120 Several submitters²³ refer to a 2007 article in the medical journal "The Lancet", in which the research group showed adverse effects on lung development in children living up to 500 metres away from a motorway [8]. Many submitters query the NZTA's use of a distance of 200 metres when assessing and discussing potential air quality effects, believing this distance is not enough and that health effects from emissions will extend beyond 200 metres.
- 121 I have reviewed this paper and note that it is based on a cohort study from Southern California, which is an area with its own particular circumstances with regard to air pollution. This is in terms of the nature of vehicle use, the nature of fuels, the nature of the fleet, the meteorological conditions of the state and the political environment in which air quality improvements have been made over recent years. Many of these are not directly relevant to New Zealand, the situation is more akin to that in the United Kingdom, where similar studies have shown opposite results [9]. I note that the situation in California is exacerbated by the problem of inversion, a meteorological effect which holds pollution above the city. This is less common in the United Kingdom and temperature inversion occurs infrequently on the Kāpiti Coast (personal communication from **Ms Borger**).
- 122 Therefore, I support the NZTA (and **Ms Borger's**) assessment that a distance of 200 metres when considering air quality effects is appropriate.

Effects on Lower Socio-Economic Groups

- 123 The submission from *Dr Kieboom* discusses how he is particularly concerned about the potential respiratory effects from vehicle emissions, as the proposed Expressway route is through a lower socio-economic area, where residents generally have higher rates of "chronic medical conditions such as asthma, diabetes, ischaemic heart disease and lung cancer".
- 124 Air quality standards, like all public health standards, are designed to protect the entire population, including the most vulnerable and so the population of concern to *Dr Kieboom* is taken into account. I also note that the conditions referred to are of widely differing natures. Whereas asthma and lung cancer are matters of direct concern with respect to air pollution from internal combustion engines, diabetes and ischaemic heart disease are only very indirectly impacted, if at all.

²³ Including the submissions of R Blok (Submitter No. 268), R Mackay (Submitter No. 404), R Love (Submitter No. 470), R Kieboom (Submitter No. 547), W Love (Submitter No. 606), J and J LeHarivel (Submitter No. 664) and E Hinkley (Submitter No. 673).

- 125 Other submitters specifically refer to air quality concerns during construction, particularly arising from dust.²⁴ I have already discussed the issue of effects on air quality during construction earlier in this evidence.

Effects on People with Respiratory or Cardiovascular Illness

- 126 Many of the submitters who are concerned about air quality effects ask specifically about the effects on themselves or members of their family who have asthma and/or sinusitis,²⁵ while some query the potential for negative health effects on other members of the local community who may have pre-existing respiratory conditions such as asthma, allergies, lung cancer and COPD.²⁶
- 127 The submission from *A Hager* and *B Laird* states "International research shows reduced lung capacity is particularly significant in those already affected by pre-existing respiratory conditions".²⁷ As well as having asthma, *Mrs Penny's* son has a mild form of spina bifida and "other health concerns". *Mr Anderson*²⁸ has also recently had a heart-attack (as well as having asthma) and is concerned about the effects the Project may have on his cardiovascular health. Mr Anderson's submission suggests that the NZTA should provide assistance with any medical costs related to Expressway.
- 128 The air quality resulting from the Expressway will not adversely impact a normal population, which does include people with diseases such as asthma (and other vulnerable individuals). Any more sensitive members of the public would have to be considered as a special case. These could be assessed on an individual basis. I would not expect there to be many, if any, such hypersensitive individuals in the Project area. However, in a Project such as this the overall public benefit should, in my view, be considered.

Water Quality Effects

- 129 Several submitters are worried about effects on water quality during construction or operation of the Expressway²⁹. *Dr Hare* is concerned

²⁴ Including the submissions of C Keno (Submitter No. 357) and K Whibley (Submitter No. 482).

²⁵ Including the submissions of P and M Smith (Submitter No. 11), A Hager and B Laird (Submitter No. 56), R Mackay (Submitter No. 404), R Love (Submitter No. 470), E and T O'Brian (Submitter No. 518), S Penny (Submitter No. 519), W Love (Submitter No. 606), K Saint (Submitter No. 607), Dr M O'Sullivan (Submitter No. 675) and M and J Anderson (Submitter No. 678).

²⁶ Including the submissions of van Riessen (Submitter No. 265), N Saxby and B Mountier (Submitter No. 327), M Sherley (Submitter No. 350), S Edbrooke (Submitter No. 517), Metlifecare Kāpiti (Submitter No. 608) and N Easthope (Submitter No. 621).

²⁷ Submitter No. 56.

²⁸ M and J Anderson (Submitter No. 678).

²⁹ Including the submissions of Dr K Hare (Submitter No. 150), L Pomare (Submitter No. 309), C Fawthorpe (Submitter No. 318), Religious Society of

about construction over waterways or run-off from Expressway polluting ground water, stating that “*many people in this area rely on ground water bores*”.³⁰ Submitters are concerned about contamination of underground aquifers through “*salination*” and/or heavy metal pollution. *Mr Fawthorpe* believes that discharges to storm-water may pollute groundwater and be bad for health.³¹

- 130 The potential for pollution of water, including any registered or unregistered ground water bores has already been addressed in my evidence and the evidence of **Ms Williams** and **Dr Laing**. In my view, the management plans and mitigation measures proposed will manage any potential effects. As noted above, any unregistered bores are potentially unsafe and should not be used in any event.
- 131 *Dr Hare*³² is also concerned about nutrification of waterways causing toxic algal blooms, which he states is “*a major health hazard*”.
- 132 It is unlikely that the type of activity proposed for this Project’s construction would cause significant nutrification of waterways; the hazard for this effect is more from biological activities. In general, sedimentary runoff will be strictly controlled (as proposed in the consent conditions) and would be predominantly inorganic; that is dirt, as opposed to plant material.
- 133 One submitter is concerned about the proposal to create sediment ponds as part of the management of water from the Project. Concern was raised about the use of chemical flocculants, and the risk these chemicals might pose to human health.³³
- 134 The chemical flocculants which might be used are thoroughly assessed and tested and do not pose a risk to human health.
- 135 *Dr O’Sullivan*³⁴ raises concern over the potential for storm-water ponds to become a vector for disease-carrying mosquitoes, leading to an increased risk of skin problems and mosquito-borne illnesses. *Dr O’Sullivan* is concerned that increasing global temperatures could lead to the establishment in such ponds, of tropical mosquito species such as those which carry Ross River Virus, and Dengue Fever.

Friends (Submitter No. 330), K Pivac (Submitter 536), E Hinkley (Submitter No. 673) and M and J Anderson (Submitter No. 678).

³⁰ Submitter No. 150.

³¹ Submitter No. 318.

³² Submitter No. 150.

³³ B Gregory (Submitter No. 270).

³⁴ M O’Sullivan (Submitter No. 675).

- 136 Any problem of mosquito-borne illnesses on the Kāpiti Coast or surrounding area would be far more significant in terms of natural and agricultural related areas of water stagnation. These already exist and are uncontrolled, as compared to those proposed to be created by the Expressway Project, which will be temporary and well controlled.

Sleep Disruption

- 137 Some submitters are concerned about the Project having effects on their sleep, either during the construction phase or during the ongoing operation of the Expressway.³⁵ These concerns mostly relate to light and noise.

- 138 For example:

138.1 *Ms Liang*³⁶ is concerned that she will have to get thick curtains to block out the light at night, and this will affect the ventilation in her room and affect her health.

138.2 *Mr Blem*³⁷ is concerned that noise and light pollution will cause "*increased sleep disorders, health problems*" causing people to "*become depressed*".

138.3 *Mr Pugh*³⁸ is a shift worker at Wellington Airport, and is concerned that both daytime and night-time construction noise as well as construction lighting at night will cause him sleep deprivation and make him dangerous in his workplace.

138.4 *Ms Staple*³⁹ is concerned about noise from truck movements on the Expressway especially in the early morning (2 am – 6 am) will cause sleep disruption and a slow deterioration in health.

138.5 *Dr O'Sullivan's* submission⁴⁰ states her son has a sleep disorder and would be particularly affected by night noise.

³⁵ Including the submissions of P and M Smith (Submitter No. 11), A Hager and B Laird (Submitter No. 56), D and D Waterson (Submitter No. 267), L Pomare (Submitter No. 309), E Laing (Submitter No. 337), H Blem (Submitter No. 440), K Pomare (Submitter No. 465), R Love (Submitter No. 470), D Kieboom (Submitter No. 494), R Pugh (Submitter No. 495), S Edbrooke (Submitter No. 517), R Baker (Submitter No. 549), H Smith (Submitter No. 602), Metlifecare Kāpiti (Submitter No. 608), R Williment (Submitter No. 620), B Karl and R Usmar (Submitter No. 660), E Staple (Submitter No. 662), M O'Sullivan (Submitter No. 675) and J Thornton (Submitter No. 711).

³⁶ Submitter No. 337.

³⁷ Submitter No. 440.

³⁸ Submitter No. 495.

³⁹ Submitter No. 662.

⁴⁰ Submitter No. 675.

She is also worried about disruption to her own sleep, as she is "*sensitive*" to this.

- 139 Sensitivity to noise falls into two broad categories:
- 139.1 Genuine noise sensitivity - There are some people who are able to hear quieter sounds than others, but the difference is not particularly great and generally not associated with health problems.
- 139.2 Perceived noise sensitivity - It is more common for people who report noise sensitivity to be psychologically sensitised to noise, which is usually present in association with another disorder such as anxiety.
- 140 It is therefore most likely that any individuals who feel they are sensitive to noise suffer from psychological sensitivity from noise, as discussed already in my evidence, as opposed to physiological sensitivity, suffering direct effects from noise. As stated above, the ability to perceive quieter sounds is not generally associated with health problems; however, if any such effects were to occur, they would not be expected to be prevented by compliance with noise Standards. That is because standards are not and cannot be designed to protect people who are outside of the "normal" population distribution. As stated earlier in this evidence, while a "normal" population includes vulnerable or sensitive individuals, it may not include "hypersensitive" individuals.
- 141 Sleep disturbance per se is less subject to variance and is an area which has been extensively studied and is the basis of recommendations underpinning public health based noise standards such as those published by the WHO and used as the reference source for the relevant New Zealand standards, such as NZS 6803:1999. Such standards protect the general population which includes a wide range of normal and atypical people but, as stated above, in some cases may not be able to protect hypersensitive individuals.
- 142 However, although that can be an issue with some responses to environmental stimuli, it is generally not the case with sleep disturbance. A sleep disorder is quite independent of external stimuli and so it does not necessarily follow that a person with a sleep disorder will be adversely affected by changes in the noise environment.
- 143 Regarding disturbance of sleep by light pollution, as stated earlier in my evidence, I am satisfied that the conditions proposed by the NZTA to mitigate light spill will prevent light pollution becoming a public health issue. In the case of light affecting a bedroom, thick curtains should be adequate to block light and, in my opinion, would

not significantly (enough to be a risk to health) block airflow into a room.

Noise

- 144 Other health-related noise concerns, unrelated to sleep disturbance, are also raised by submitters.⁴¹

Effects on Individuals with Noise Sensitivity

- 145 One submitter, *Mr B Laird*,⁴² suffers from tinnitus and believes this condition will be exacerbated by noise from traffic on the Expressway. *Dr O'Sullivan*⁴³ also suffers from tinnitus and says that prolonged exposure to construction noise at her home will be "*capable of causing hearing loss and will most certainly exacerbate my existing tinnitus*".
- 146 Having read the reports by **Ms Wilkening**, I am entirely confident that the noise levels under construction or operation of the Expressway could not have any adverse effect on hearing and will not exacerbate tinnitus. In fact, tinnitus is usually a worse problem for the sufferer in a very quiet environment.
- 147 Other submitters ask about the effects of noise on their own health. One submitter⁴⁴ has Asperger's Syndrome and says that he is particularly susceptible to noise and changes in routine. He states that he has a noisy job and, with his condition, he especially needs a quiet home to recover/regroup. *Ms E Laing*⁴⁵ states that she has "*noise-sensitive*" occupants in her house whose health will be affected by the noise (predicted to be 50 dB). *Dr Weber*⁴⁶ states that a quiet household is especially important for her, as son is partially deaf.
- 148 Any resident does have the right to quiet enjoyment of their environment. However, the definition of quiet is covered by relevant public health standards, which has limits designed to

⁴¹ Including the submissions of D Hare (Submitter No. 207), M Hare (Submitter No. 209), L and P Tong, (Submitter No. 228), J Scrimshaw (Submitter No. 304), N Saxby and B Mountier (Submitter No. 327), E Laing (Submitter No. 337), J and J Kelly (Submitter No. 339), (Submitter No. 348), M Anderson, (Submitter No. 378), G McCall (Submitter No. 390), V Palmer (Submitter No. 486), R Pugh (Submitter No. 495), Paraparaumu Raumati Community Board (Submitter No. 501), S Edbrooke (Submitter No. 517), W Hamilton (Submitter No. 532), S Mills (Submitter No. 543), N Easthope (Submitter No. 621), S Kenward (Submitter No. 642), A Carter (Submitter No. 656), B Karl and R Usmar (Submitter No. 660), , M O'Sullivan (Submitter No. 675), Kāpiti Coast District Council (Submitter No. 682) and J Thornton (Submitter No. 711).

⁴² A Hager and B Laird (Submitter No. 56).

⁴³ M O'Sullivan (Submitter No. 675).

⁴⁴ D and D Waterson (Submitter No. 267).

⁴⁵ Submitter No. 337.

⁴⁶ J Weber (Submitter No. 529).

ensure an adequately quiet home environment is protected. All such noise Standards will be complied with during the proposed Expressway's operation and will generally be complied with during construction, with site specific measures in place to manage occasions of non-compliance with the recommended criteria. As noted above, I do not consider that occasional exceedances of the recommended criteria in NZS 6003:1999 (which will occur here) to be harmful to public health.

- 149 The submission from *Ms E Jones*⁴⁷ also raises specific concern about noise. *Ms Jones* states that she moved to her current property in order to escape airport noise, as her daughter has a head injury and "cannot tune out background noise well, becoming very stressed by noise, enduring painful increased spasticity". *Ms Jones* states that her daughter could not tolerate the airport noise, even though it was within the allowable levels. Therefore she is worried about the noise from the Project disturbing her daughter, even if it is at "allowable" levels which would not affect the health of individuals.
- 150 The situation of people with after effects of head injuries and noise is difficult, but it is impossible to predict whether particular sounds arising from construction and operation of this Expressway will affect *Ms Jones'* daughter. However, while a person with a head injury may be more sensitive to noise, the vast majority would still remain within the "normal" population distribution and would be adequately protected by noise standards. This may be the case for *Ms Jones'* daughter.

Effects on Other Pre-Existing Health Problems

- 151 The submission from *A Hager and B Laird*⁴⁸ also raises concern over the effects of noise on blood pressure and ischemic heart disease. They attach a copy of a 2011 publication by the WHO entitled 'Burden of Disease from Environmental Noise', stating that this shows that exposure to high levels of environmental noise leads to an increased risk of cardiovascular disease. *Mr Laird* has a family history of heart disease and believes this risk will be worsened by the presence on an Expressway near his home.
- 152 I am familiar with the WHO paper from 2011. However, I note that this is not intended to replace any existing public health standards, but is a discussion to lead to future prioritisation in community design. It does not follow that an individual with a family history of heart disease will be adversely affected by noise as well. Any effect of noise on anxiety, and indirectly perhaps on cardiovascular risk, is quite independent. Such a relationship has been advanced but is not proven and does not form a revised basis for public health decisions.

⁴⁷ Submitter No. 709.

⁴⁸ Submitter No. 56.

Noise and Annoyance

- 153 *Ms Hager and Mr Laird*⁴⁹ also discuss annoyance (as defined by the WHO) as a result of environmental noise and quotes the WHO as stating: a “*high level of annoyance caused by environmental noise should be considered as one of the environmental health burdens*”.
- 154 Noise is a physical entity and not necessarily annoying. Annoyance is a subjective human response, which can be either an amenity or a health issue. My brief is in regards to health issues and I consider these are adequately controlled by relevant Standards in New Zealand.

Noise and Effects on Cognition

- 155 *Ms Hager and Mr Laird*⁵⁰ also discuss concerns over noise “pollution” causing cognitive impairment, again referring to the WHO document discussed above.
- 156 The idea that “noise pollution” causes cognitive impairment is generic and is not evidentially based. Resource management decisions have to be made in a much more precise way. The reference to these WHO documents and some of the other comments made by the submitters do raise the matter of the importance of the principles of the Resource Management Act 1991 (RMA). This relatively sophisticated piece of legislation, by international standards, has its own well established level of acceptable risk and precaution for which direct recourse to scientific evidence is often heard in matters before the Court, and forms the basis for decisions.
- 157 I understand that this is largely a legal matter but it is also a field within my area of expertise. I have considerable experience having often assisted the Environment Court in giving expert evidence on these matters. In my view, the process of preparation of WHO documents, whilst of undoubted value in promoting international discussion and particularly leading change in third world countries, is not as robust as the methodology required by the New Zealand RMA.

WHO Recommendations, Standards and BPO

- 158 The submission from *Dr Hare*⁵¹ is concerned about noise during the operation of the Expressway and states: “*the decibel rating for a expressway in a residential area is outside current international world-health organisation recommendations*”. *D Hare’s* submission⁵² states that the WHO recommends external traffic noise should not

⁴⁹ Submitter No. 56.

⁵⁰ Submitter No. 56.

⁵¹ Submitter No. 150.

⁵² Submitter No. 207.

exceed 50 dB during the day and 45 dB at night, but that the NZTA won't mitigate for noise until the levels are over 57 dB. The *Paraparaumu Raumati Community Board's* submission states "Some 34 houses are identified as likely to suffer health issues in particular noise in excess of 64 decibels".⁵³

- 159 Above, I have discussed the relevance of WHO recommendations and data, noting that Standards New Zealand takes account of the WHO's work and applies it in the context of local conditions, when setting New Zealand Standards. In any environment, a current local standard should always be preferred over a guideline and that is the case for this Project.
- 160 **Ms Wilkening's** evidence explains the predicted noise levels arising from the Project's construction and operation and the mitigation measures proposed. I have already outlined why I do not consider that the predicted noise levels will be such that adverse health effects will arise.
- 161 The submission from *Mrs Schager*⁵⁴ queries whether the BPO is good enough to "guarantee" there will not be any health (or other) effects as a result of noise and vibration.
- 162 The use of the word "guarantee" is inappropriate in the context of public health and planning decisions, as nothing can be guaranteed. I agree with the BPO approach, which has been adopted by **Ms Wilkening**. The appropriate concept is an assurance of best practise with a goal of minimising or, preferably eliminating, health effects from any activity, unless the importance of that activity requires a lesser threshold. This is like the process of standard setting, where the best appropriate advice and science is considered and applied appropriately, considering what is realistically practicable.
- Low Frequency Sound**
- 163 Some submitters raise the issue of low frequency sound.⁵⁵ *N Saxby and B Mountier* are concerned that noise barriers won't be enough, as individual noise sensitivity, "especially to low frequency sound" varies and noise and/or vibration could become health issue for some, even if the appropriate standards are met. *Dr M O'Sullivan* states that she is sensitive to noise "including low frequency noise and experience headaches and other stress reactions when exposed to it for any length of time".

⁵³ Submitter No. 501.

⁵⁴ Submitter No. 312.

⁵⁵ Including N Saxby and B Mountier (Submitter No. 327) and M O'Sullivan (Submitter No. 675).

- 164 The effects of low frequency noise, from a physiological point of view, are not significantly different to effects from higher frequencies of sound, provided sound is measured using appropriate weighting to adjust sound pressure levels to the response of the human ear. This is achieved by "A" weighting which I note has been adopted by **Ms Wilkening**. When considering vibration, that is sound pressure changes in air below the audible levels, "A" weighting is no longer appropriate and is taken off, therefore the sound pressure levels appear to rise. However at the lowest audible frequencies, around 20 Hz, the unweighted sound pressure levels are still well below, by factors of tens of thousands, any non-auditory physiological effects.

Vibration

- 165 Some submitters have specific concerns about the potential for health effects as a result of ground vibration. For example, the *Kāpiti Coast District Council*⁵⁶ (KCDC) is concerned about the "uncertain" health effects of vibration, and calls for vibration measurements to be made during construction, at the first use of each high-vibration machine (in order to determine "risk contours"). The KCDC is also concerned about the health effects of vibration during the operation of the Expressway.
- 166 As discussed earlier in this evidence, there will be no health effects for members of the public as a result of construction or operational vibrations, as any such vibration-associated health conditions only occur at much higher magnitudes than those which the public will experience as a result of this Project. Regarding measurements on equipment, this is, in my opinion, not necessary. This Project will use standard construction equipment which is used in many other projects, without effects on public health. However, I note that in his evidence, **Mr Whitlock**, has included into the CNVMP, the requirement to measure high vibration equipment at the first use. I consider this should provide reassurance to the KCDC that the levels of vibration produced by the equipment used for the Project will not be significant enough to impact on public health.
- 167 Another submitter⁵⁷ is concerned that pile driving during construction will "send ground shock waves that will have people feeling like they are living in a constant earthquake zone", referring to Christchurch for an example of the health impacts of this.
- 168 The effects of living in an earthquake zone are predominantly fear of the effects of the earthquake. These should not exist when ground vibration arises from a temporary and reversible source, such as pile driving. This concern is not supported by evidence, as there should

⁵⁶ Submitter No. 682.

⁵⁷ C Keno (Submitter No. 357).

be no source of fear to health and safety from vibration produced through this Project.

- 169 The submission from *Dr O'Sullivan*⁵⁸ raises the issue of vibration and VAD, "*which is severely debilitating and can be fatal*". *Dr O'Sullivan* also states that she is sensitive to vibration from "*wi fi*", so is particularly concerned about the effects of vibration on herself.
- 170 VAD is a specific and well defined clinical entity which occurs at very high levels of vibration occurring in industrial situations. The minimal levels at which this occur are many orders of magnitude above any levels which will be encountered either during the construction or operation of this Expressway. VAD is not a matter which needs to be considered in this case.

Stress and Mental Health

- 171 Another issue raised by submitters relates to potential effects of the Project on stress, anxiety and mental health.⁵⁹ The submission from *P and M Smith* states that worry about the Project and its effects has already resulted in both submitters suffering from raised blood pressure, while *A Hager and B Laird* are concerned about stress causing depression.⁶⁰ Many submissions are concerned about health effects as a result of stress due to loneliness and perceived isolation, based on the belief that the Expressway will cut them off from the rest of the community. Some submissions are concerned about noise and/or light and/or vibration from the operation of the Expressway causing stress and anxiety.
- 172 These are matters of social, rather than medical consideration and relate to amenity effects on community. I note that good communication protocols, as are proposed here, are important in minimising stress and anxiety, wherever possible.
- 173 Some submissions refer to someone who suffers from alopecia universalis,⁶¹ a condition which they believe is affected by stress. They are concerned stress resulting from the Project will make this condition worse.

⁵⁸ Submitter No. 675.

⁵⁹ Including the submissions of P and M Smith (Submitter No. 11), A Hager and B Laird (Submitter No. 56), D Hare (Submitter No. 207), C Lenk (Submitter No. 329), W Frost (Submitter No. 496), N Wilson (Submitter No. 499), E and T O'Brien (Submitter No. 518), E Leonard-Taylor (Submitter No. 594), Metlifecare Kāpiti (Submitter No. 608), N Easthope (Submitter No. 621), B Karl and R Usmar (Submitter No. 660), S Woods (Submitter No. 723) and J Svendsen (Submitter No. 733).

⁶⁰ Submitter No. 11 and No. 56 respectively.

⁶¹ Including the submissions of R Love (Submitter No. 470) and W Love (Submitter No. 606).

- 174 Any stress related diseases which are pre-existing may be exacerbated by change in the community, but that is not a reason not to proceed with this change. Individual cases may have to be managed as such.

Dr Marie O’Sullivan’s Health Impact Assessment

- 175 Several submissions refer to an “independent” Health Impact Assessment (HIA) by *Dr Marie O’Sullivan*.⁶² *Dr O’Sullivan* has a PhD in psychology and is a lecturer in Public Health at Wellington School of Medicine. I have read this HIA and will respond to *Dr O’Sullivan’s* assessment below. However, I first must note that *Dr O’Sullivan’s* report cannot really be treated as truly independent, as *Dr O’Sullivan* herself is an affected resident, living only 50 metres from the proposed Expressway. *Dr O’Sullivan* is also a submitter against the Project.⁶³
- 176 *Dr O’Sullivan’s* HIA reports that people who live within 400 m of the proposed Expressway will have “*exacerbation of existing health conditions, particularly those with hearing impairment, sleep disorders and cardiac disease*”. The HIA also identifies other health conditions associated with living proximal to motorways, such as asthma, bronchitis, neurodegenerative conditions, dementia, Alzheimer’s Disease, sleep disorders, cardiac disease, hearing impairment, lung cancer, hypersensitivity, cognitive defects in children, childhood obesity, stroke, cardiovascular mortality, stress disorders, depression, VAD and pregnancy complications.
- 177 Overall, whilst this HIA makes some interesting points, the approach taken does not follow the methodology of the RMA. Many of the ideas raised are not established and to the extent that they are relevant have been covered by the RMA approach already taken by the NZTA.
- 178 *Dr O’Sullivan* advocates a precautionary-type approach and bases many of her assertions on the health effects of emissions on one single paper. This is an unduly precautionary approach. A single paper, while raising some interesting points for further research, is not strong enough grounds for altering policy-making decisions. I understand that the RMA is not an absolute “no risk” statute, but instead, a risk-averse statute. It is my opinion that the Project as designed and planned by the NZTA is already appropriate under the RMA, in the sense that it will continue through its construction and operation phases to, minimise and mitigate potential risks.

⁶² Including the submissions of C Lenk (Submitter No. 329), M Sherley (Submitter No. 350), R Baker (Submitter No. 549), J Nisbet (Submitter No. 649), B Begovich (Submitter No. 669) and Action to Protect and Sustain our Communities (Submitter No. 677).

⁶³ Submitter No. 675.

Paraparaumu Medical Centre (PMC)

179 The *Paraparaumu Medical Centre*⁶⁴ (PMC) is concerned about the health effects of both the construction and operation of the Expressway on the patients visiting their clinic. The clinic is adjacent to the proposed Kāpiti Road off-ramp, and will be in close proximity to the works and operating Expressway. The doctors are concerned that noise from the Project will affect patient consultations, with the potential to make them unsafe. For example, certain health examinations require silence to listen for irregularities. They are also concerned that vibrations will affect the operation of some of their equipment, such as electrocardiograph (ECG) machines.

180 Concerns over health effects due to difficulties accessing the PMC were also raised by other submitters.⁶⁵

181 I visited the environs of the PMC on my site visit on 28 August 2012. I note that the PMC is located on the northern side of Kāpiti Road, near to the land proposed to be designated for the Expressway. However, the PMC's proximity to Kāpiti Road is closer than it will be to the Expressway. I note that **Ms Wilkening** proposes a number of measures to mitigate noise on the PMC during construction. During operation, the noise level at the Centre site is predicted to be 54 dB $L_{Aeq(24h)}$ (i.e. within Category A, the most stringent category). I would not expect noise from the Expressway to exceed that currently coming from Kāpiti Road, which was observed to carry considerable heavy traffic. I note this is consistent with **Ms Wilkening's** observations also.

182 The technical matters raised relating to medical examinations and equipment cannot be sustained after inspection of the site. Vibration of the building is far more likely from the existing road than it would be from the Expressway, which will have much better foundations and will be elevated above the plane, which currently accommodates both Kāpiti Road and the PMC. In any event, modern ECG machines operated correctly are unlikely to be affected.

Metlifecare Kāpiti Retirement Village

183 The retirement village owned by *Metlifecare Kāpiti* has been identified as a "sensitive receptor." Its submission⁶⁶ raises a whole range of concerns about effects on their residents, including effects from construction dust, emissions, vibrations, noise and water quality, operational noise, emissions, and light disturbance. The submitter is particularly concerned about the cardiovascular and respiratory health of its residents and the health effects of anxiety

⁶⁴ Submitter No. 521.

⁶⁵ I Mackay (Submitter No. 402).

⁶⁶ Submitter No. 608.

and sleep disturbance. The specific concerns raised in relation to noise, air quality etc, are discussed in the evidence of other witnesses.

- 184 As already discussed in my evidence, while the residents of the retirement village may be more sensitive to noise and air quality effects than many members of the community, they still generally fall within the "normal" population distribution and are adequately protected by appropriate Standards. There is no reason to believe that the development of the Expressway would have any adverse effects on the inhabitants, provided compliance with the appropriate Standards is generally maintained, as is proposed by the NZTA.

Other Concerns

- 185 One submitter⁶⁷ has chronic nerve pain exacerbated by stress and disrupted sleep. She is concerned about the effects of the Project on her condition. Another submitter⁶⁸ says that she moved to her current residence because stress at her previous location due to construction and traffic noise (from a nearby flyover) caused her to have a burst ulcer. Another submitter, *Mrs Mountier*,⁶⁹ suffers from migraines, and is concerned that light and dust from the Project will be a problem for her health, as she needs dark and fresh air to recover when she has such an attack. Another submitter⁷⁰ says that he and his son suffer from health issues which will be affected by Project. He does not elaborate on what these concerns are.
- 186 New large roads, such as Expressways, do not necessarily cause health disturbance. For example, the Auckland motorway system, which has been established since the 1950s, does not prevent people continuing to live immediately adjacent to this extremely busy road and has also not prevented the ongoing construction of new properties and developments in the immediately adjacent area. It does not follow that health conditions will inevitably be affected by the introduction of a new, large road.
- 187 A few submitters raise concerns about the potential for health effects as a result of the contamination of home-grown fruit and vegetables with heavy metals and pollutants, either through dust or contaminated ground water (during construction) or from vehicle exhaust (during operation).⁷¹

⁶⁷ A Hager and B Laird (Submitter No. 56).

⁶⁸ M Hare (Submitter No. 209).

⁶⁹ N Saxby and B Mountier (Submitter No. 327).

⁷⁰ K Pomare (Submitter No. 465).

⁷¹ Including the submissions of A Hager and B Laird (Submitter No. 56), L Pomare (Submitter No. 309), J Weber (Submitter No. 529), M and J Anderson (Submitter No. 678) and S Woods (Submitter No. 723).

- 188 This is a valid concern but is readily overcome by washing of vegetables as the particular by-products are generally carboniferous and to the extent that toxic substances (such as heavy metals) are involved in a garden adjacent to a road, the greatest source of these is usually still the use of a petrol driven domestic lawnmower. I have already addressed the issue of contamination of water.
- 189 Several submitters are worried about the proposed excavation and relocation of known contaminated soil, as part of the Project.⁷² They are concerned about the potential for contaminants from the soil to cause health effects either through inhalation of dust or through contamination of waterways.
- 190 This is a matter which will be subject to rigorous scrutiny during the Project's construction process and I am confident that the measures outlined in the CEMP, the CSGMP and the CSMPPH, together with the conditions for sediment and dust control, will be adequate to protect the public from any exposure to contaminated soil.
- 191 Some submitters are concerned about secondary health effects of changes in air quality, such as a decrease in walking (in favour of driving) and a decrease in active backyard and outdoor play.⁷³ The submitters believe the emissions from traffic will lead to less outdoor physical activity, resulting in long-term health effects for the community.
- 192 In general, backyard activities are not less in areas adjacent to existing roads on the Kāpiti Coast. As noted above, I consider that overall, effects on air quality will be lessened by concentrating traffic flowing in a steady stream with minimal fuel consumption and maximal engine efficiency. I also note that the Project includes planned walk and cycle ways, which are likely to be used by the local community to further their outdoor activities.
- 193 Some submissions raise general concerns about the potential for health effects which are not further elaborated on.⁷⁴ For example,

⁷² Including the submissions of Dr K Hare (Submitter No. 150), B Gregory (Submitter No. 270), M Cooke-Willis (Submitter No. 398), R Dussler (Submitter No. 575) and Kāpiti Coast District Council (Submitter No. 682).

⁷³ Including the submissions of M Lewis (Submitter No. 427) and J Weber (Submitter No. 529).

⁷⁴ Including the submissions of Nikau Midwives (Submitter No. 70), C and M Dearden (Submitter No. 261), J Anderton and J Abigail (Submitter No. 293), A Bowman (Submitter No. 301), P Scrimshaw (Submitter No. 307), M Nixon (Submitter No. 320), S Biddiscombe (Submitter No. 321), Te Ra School (Submitter No. 340), F Vagg (Submitter No. 348), M Anderson, (Submitter No. 378), P Aregger (Submitter No. 382), A Cherrill (Submitter No. 399), R Cherrill (Submitter No. 400), J Cherrill (Submitter No. 401), J Brass (Submitter No. 407), M Lepionka (Submitter No. 416), C and I Baxter (Submitter No. 422), K and S Gray (Submitter No. 424), R Brass (Submitter No. 428), B and J Inge (Submitter No. 429), C Beaufort (Submitter No. 434), A and L Pritchard (Submitter No. 437), Public Transport Voice (Submitter No. 441), V Pilatova (Submitter No. 449), S Madden (Submitter No. 459), A Breu (Submitter No. 467), Waikanae Property

these included comments such as *"construction will add a further health-destroying layer of noise, vibration and dust"*, or statements that they have concerns about *"health effects"* of the Project, or simply ticking the submission boxes stating they object to the Project on the grounds of *"the impact on a healthy environment disturbed by excess traffic noise, lights visual pollution"* and/or *"the impact of emissions on health and global warming"*.

- 194 I have already addressed all of the potential health-related issues in other sections of this evidence.

CONCLUSIONS

- 195 I have assessed the potential public health impacts of this Project.
- 196 There will be some impact on the Kāpiti Coast communities through which the Expressway passes. Some will gain improved amenity values by the streaming of through traffic in a more efficient and less polluting manner. Some will experience a decrease in amenity values due to the proximity of the Expressway.
- 197 Regarding emissions, the impact on public health overall is likely to be positive, in that the Expressway will remove through traffic from the living environment of urban roads and allow vehicles to be operated in a manner which is less polluting and safer.
- 198 Regarding soil and water quality effects, provided compliance with the conditions, controls and mitigation relating to sediment run-off and dust, as outlined in the CEMP and related management plans, I am confident there will be no effects on public health.
- 199 Regarding noise, health effects can be avoided by compliance with the appropriate Standards, as has been proposed by NZTA. For construction noise, general compliance with NZS 6803:1999 is acceptable, as occasional exceedances of this Standard will not affect public health. For the operational phase of the Project, strict

Development Limited (Submitter No. 474), A Beechey (Submitter No. 490), B Cherry (Submitter No. 492), Save Kāpiti (Submitter 505), J Midgley (Submitter No. 506), E Dawidowski (Submitter No. 508), J Short and G Schwass (Submitter No. 531), L Robertson (Submitter No. 563), S Arnold (Submitter No. 567), J Frost-Evans (Submitter No. 568), S West (Submitter No. 573), C Bull (Submitter No. 576), L Duckworth (Submitter No. 585), Mr and Dr Roos (Submitter 586), R Starke (Submitter No. 589), M Young (Submitter No. 596), S Heppenstall (Submitter No. 598), R Childs (Submitter No. 603), J Leibrich (Submitter No. 604), D Connal (Submitter No. 616), B Lindsay (Submitter No. 622), A Parata (Submitter No. 625), S Coombes (Submitter No. 626), H Gaskin (Submitter No. 627), B Connell (Submitter No. 628), G Ibell (Submitter No. 640), D and S Simmons (Submitter No. 648), T Brown (Submitter No. 650), N Beechey (Submitter No. 663), R Caldwell (Submitter No. 666), H Chambers (Submitter No. 668), G Hooker (Submitter No. 680), D Peters (Submitter No. 693), M Roxburgh (Submitter No. 705), H Farr (Submitter No. 727), J Svendsen (Submitter No. 733), J Scott (Submitter No. 735) and N Stacy (Submitter No. 737).

compliance with NZS 6806:2010 will be necessary to ensure that public health is protected.

- 200 Vibration effects and lighting effects will be minimal and can be adequately controlled and will not pose a risk to public health.
- 201 Mental health effects are best managed through open and clear communication with the public, and I am satisfied that the NZTA is taking a suitable approach to this aspect of the Project.
- 202 I am confident that potential public health effects have been thoroughly considered in the development of this Project.



Dr David Russell Black
7 September 2012

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