

**Before a Board of Inquiry**  
**Northern Corridor Improvements Project**

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Under the Resource Management Act 1991 ('the Act')

In the matter of a Board of Inquiry appointed under section 149J of the Act to consider notices of requirement for designations and resource consent applications by the New Zealand Transport Agency for the Northern Corridor Improvements Project

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**Statement of evidence of Siiri Wilkening for the New Zealand Transport Agency (Construction noise and vibration)**

Dated 20 April 2017

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## STATEMENT OF EVIDENCE OF SIIRI WILKENING FOR THE NEW ZEALAND TRANSPORT AGENCY

### 1 Qualifications and experience

- 1.1 My full name is Siiri Wilkening.
- 1.2 My qualifications and experience are set out in my other statement of evidence relating to operational noise and vibration.<sup>1</sup>

### 2 Involvement with the Project

- 2.1 My evidence relates to notices of requirement and resource consent applications lodged by the New Zealand Transport Agency ('**Transport Agency**') with the Environmental Protection Authority on 14 December 2016 for the Northern Corridor Improvements Project ('**Project**').
- 2.2 I am familiar with the area that the Project covers, the State highway and the local roading network in the vicinity of the Project.
- 2.3 My role in the Project included supervising and reviewing the construction noise and vibration assessment undertaken by my colleague Peter Ibbotson. I have co-authored and reviewed the *Construction Noise and Vibration Assessment* (Technical Report), included in the Assessment of Environmental Effects ('**AEE**').
- 2.4 Operational noise and vibration effects of the Project require separate consideration and have been assessed and reported on by myself. Operational noise and vibration effects of the Project are discussed in a separate brief of evidence.<sup>2</sup>

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<sup>1</sup> Refer paragraphs 1.2 to 1.4 of Ms Wilkening's evidence in chief (Operational noise and vibration)

<sup>2</sup> Refer Ms Wilkening's evidence in chief (Operational noise and vibration).

### **3 Code of conduct**

- 3.1 I have read and am familiar with the Code of Conduct for Expert Witnesses in the current Environment Court Practice Note (2014), have complied with it in the preparation of this evidence, and will follow the Code when presenting evidence to the Board. I also confirm that the matters addressed in this statement of evidence are within my area of expertise, except where I rely on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

### **4 Scope of evidence**

- 4.1 This evidence addresses the following matters:
- a Acoustic performance standards;
  - b Assessment methodology;
  - c Existing noise environment;
  - d Assessment of construction noise and vibration effects;
  - e Construction noise and vibration management and mitigation;
  - f Comments on submissions;
  - g Response to section 149G(3) key issues report; and
  - h Conclusions.
- 4.2 In preparing my evidence, I have reviewed relevant parts of the following evidence:
- a Mr Glucina, Transport Agency;
  - b Mr Moore, Project Design;
  - c Mr Hale, Construction;
  - d Mr Clark, Transportation;

- e Mr McGahan, Planning (resource consents); and
- f Mr Burn, Planning (designations).

## **5 Executive summary**

- 5.1 I, and my colleague Peter Ibbotson, have assessed the construction noise and vibration effects from the Project, in accordance with accepted and tested standards and guidelines.
- 5.2 The nature of construction means that noise and vibration levels generated are generally higher than ongoing activities. We have assessed the risk of exceeding relevant criteria. Where buildings are in close proximity (both dwellings and businesses), there is a high risk of exceeding the noise and vibration criteria for limited times during construction.
- 5.3 Therefore, a thorough regime of noise and vibration management will be required which will ensure that effects are mitigated and managed as far as practicable. This will be anchored in the Construction Noise and Vibration Management Plan.
- 5.4 Communication with affected parties is the most important and effective management measure. Frequent information and updates to neighbouring communities will allow dialogue between the construction contractor and residents and businesses potentially affected by the works.
- 5.5 Overall, while the Project construction will likely result in temporary disturbance to nearby residents and businesses, I consider that the Project can be constructed in such a way that any adverse construction noise and vibration effects are either mitigated or specifically managed to reduce effects as far as practicable.

## **6 Acoustic performance standards**

### *Noise*

- 6.1 NZS 6803:1999 is the most commonly used and, in my opinion, the most appropriate standard on which to base an assessment of construction

noise effects.<sup>3</sup> NZS6803:1999 is also referenced in the Auckland Unitary Plan as applying to construction noise (E25.6.1(3)).

- 6.2 I consider application of NZS 6803:1999 will achieve equitable treatment of all affected parties and acceptable noise levels from Project construction activities (addressing both amenity and health issues associated with construction noise). The standard sets appropriate noise criteria that should be complied with if practicable. Where full compliance with the criteria is not practicable, alternative measures should be employed to deal with the potential exceedance.
- 6.3 I have recommended that the criteria of NZS 6803:1999 be applied to the Project, which are shown in recommended Condition CNV.5.<sup>4</sup>

#### *Vibration*

- 6.4 There are no current New Zealand standards that address construction vibration. Accordingly, I have, for assessment purposes, adopted vibration criteria from the Transport Agency's "*State Highway construction and maintenance noise and vibration guide*" which have been successfully applied to other large infrastructure projects in New Zealand, including other Roads of National Significance.<sup>5</sup>
- 6.5 In summary, the construction vibration criteria I have proposed incorporate two categories that are designed to first protect amenity (i.e. avoid annoyance) (Category A), then avoid any, including cosmetic, building damage (Category B). The values vary depending on the time of day, receiver type and vibration source. Category A can only be exceeded if specified management is implemented, as set out in proposed designation conditions CNV.6.<sup>6</sup>

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<sup>3</sup> Refer Section 2.1.3, Construction Noise and Vibration Assessment (Technical Report).

<sup>4</sup> Refer Appendix A Proposed Conditions, Assessment of Environmental Effects ('AEE').

<sup>5</sup> Such as Puhoi to Warkworth, MacKays to Peka Peka, Waterview Connection and Transmission Gully.

<sup>6</sup> Refer Appendix C, Construction Noise and Vibration Assessment (Technical Report); and Appendix A - Proposed Conditions, AEE.

## 7 Assessment methodology

### *Noise*

- 7.1 The methodology used for the construction noise assessment<sup>7</sup> is summarised as follows:<sup>8</sup>
- a Determination of ambient noise levels in the vicinity of the Project through measurements;<sup>9</sup>
  - b Review and determination of suitable noise criteria based on relevant standards and ambient noise levels where appropriate;
  - c Prediction of noise envelopes for each construction activity/process, beyond which the daytime and/or night-time noise criteria can be complied with without mitigation, based on standard data and information obtained through previous similar projects;<sup>10</sup>
  - d Determination of the number and location of dwellings and business premises likely to receive noise levels that would exceed the noise criteria of (b) above;<sup>11</sup>
  - e Recommendation of best practice management and mitigation measures to fulfil the requirements of Section 16 of the Resource Management Act 1991 ('**RMA**') and to avoid or appropriately manage exceedance of the Project noise criteria, taking into consideration the duration, variability and temporary nature of the construction works.<sup>12</sup>

### *Vibration*

- 7.2 The methodology used for the construction vibration assessment<sup>13</sup> can be summarised as follows:

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<sup>7</sup> Refer Section 3, Construction Noise and Vibration Assessment (Technical Report).

<sup>8</sup> This work was undertaken by Peter Ibbotson of Marshall Day Acoustics ('**MDA**'), with my input.

<sup>9</sup> Refer Section 4, Construction Noise and Vibration Assessment (Technical Report).

<sup>10</sup> Refer Section 3.2 and 5.2, Construction Noise and Vibration Assessment (Technical Report).

<sup>11</sup> Refer Section 6.1 and Appendix E, Construction Noise and Vibration Assessment (Technical Report).

<sup>12</sup> Refer Section 8, Construction Noise and Vibration Assessment (Technical Report).

<sup>13</sup> Refer Section 3.3, Construction Noise and Vibration Assessment (Technical Report). The assessment was undertaken by Peter Ibbotson of MDA.

- a Determination of appropriate construction vibration criteria;<sup>14</sup>
- b Calculation of “safe distances” from high vibration activities such as vibro-piling, impact piling and vibratory rollers;<sup>15</sup>
- c Determination of buildings that have a medium or high risk of experiencing vibration levels exceeding the relevant criteria;<sup>16</sup>
- d Recommendation of vibration mitigation and management measures, including pre-construction building condition surveys for buildings in close proximity to high vibration generating activities.<sup>17</sup>

## 8 Existing environment

- 8.1 The existing ambient noise environment is described in my operational noise and vibration evidence, paragraphs 8.1 to 8.4.
- 8.2 In summary, existing ambient noise levels range from 56 to 70 dB  $L_{Aeq(daytime)}$ . Night-time levels are significantly lower, ranging from 46 to 65 dB  $L_{Aeq(night-time)}$ .<sup>18</sup>
- 8.3 Overall, the Project area is in close proximity to two major highways and therefore affected by traffic noise from these roads.

## 9 Assessment of construction noise and vibration effects

### *Noise*

- 9.1 Construction activity is inherently noisy. Nevertheless, the RMA and NZS 6803:1999 require that noise levels are managed and mitigated so as to not exceed a reasonable level.<sup>19</sup> For that reason, the focus of any construction noise assessment is on managing the noise levels and resulting effects, rather than requiring compliance with a specific limit, although criteria are used to provide trigger points for action.

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<sup>14</sup> Transport Agency State highway construction and maintenance noise and vibration guide.

<sup>15</sup> Refer Section 7.3, Construction Noise and Vibration Assessment (Technical Report).

<sup>16</sup> Refer Section 7.3 and Appendix F, Construction Noise and Vibration Assessment (Technical Report).

<sup>17</sup> Refer Section 8.3, Construction Noise and Vibration Assessment (Technical Report).

<sup>18</sup> Refer Section 4, Construction Noise and Vibration Assessment (Technical Report).

<sup>19</sup> Refer Sections 7.1.1, 7.4 and 8, NZS 6803:1999.



- 9.2 The most effective way to control construction noise is through good on-site management and communication between site managers and staff, and between the constructor and the public. I consider such management and mitigation measures are best formulated at a time when the detailed design is known and a contractor has been appointed. At that time, the details of construction necessary to allow for meaningful assessment of required management and mitigation will be known.<sup>20</sup>
- 9.3 Some buildings are within close proximity to the proposed works. Some of these will receive acoustic screening from construction noise from barriers and other structures that have been, or are proposed to be, constructed along State highway 1 ('SH1') and State highway 18 ('SH18'), or from terrain formations. Other buildings, however, will receive little screening, e.g. multi storey apartment buildings adjacent to SH1.
- 9.4 Most dwellings fronting SH1 and SH18 will be affected to varying degrees during construction. Due to the close proximity of dwellings and businesses to the construction works, there are many locations where there is potential for daytime and night-time noise limits to be exceeded. Some dwellings are likely to be exposed to noise levels greater than 70 dB L<sub>Aeq</sub> from construction works during daytime piling activity. In addition, some dwellings will be exposed to night-time noise levels greater than 45 dB L<sub>Aeq</sub> during bridge works which need to occur at night. However, the effects on each dwelling would be for a limited time only, i.e. while construction is being undertaken in the vicinity, before moving along the alignment.
- 9.5 Based on my previous experience with large infrastructure construction projects, construction noise effects are of a temporary nature and are generally tolerated well by residents when the contractor engages in effective and timely communication and consultation.
- 9.6 Commercial and industrial activities will also be exposed to high day and night-time noise levels. However, these activities are generally less

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<sup>20</sup> For instance, details on equipment type and size, staging, location and duration of specific construction works, responsible personnel to respond to residents' questions and concerns. Without this detailed information, a management plan would not be effective in responding appropriately to the site specific issues.

sensitive to noise. Noise levels would be managed appropriately through communication and engagement.

### *Vibration*

- 9.7 In a residential environment, people can usually perceive vibration at a level of 0.3 mm/s,<sup>21</sup> but the risk of building damage only exists above 5 mm/s.<sup>22</sup> Therefore, vibration is felt at levels significantly lower than those that would cause building damage.
- 9.8 The recommended vibration criteria contain Categories A and B, and criteria are applied progressively to address both annoyance and building damage effects.
- 9.9 Based on the likely construction equipment and activities, there is a risk of vibration creating both annoyance and building damage where buildings are located very close to the works (i.e. less than 20 metres from retaining wall construction or potential vibro-compaction).
- 9.10 Construction vibration is more difficult to mitigate, and should be managed at the source by using low-vibration construction techniques (e.g. implementing drilled piling rather than vibro or impact piling) and managing the timing of works.<sup>23</sup>
- 9.11 Vibration effects can be managed by communicating with potentially affected residents in a timely manner and explaining that vibrations will start to be felt at magnitudes well below those levels that would cause building damage. Nevertheless, people may be disturbed by vibration levels for limited times when high vibration equipment is used in close proximity.
- 9.12 In addition, building condition surveys and monitoring of vibration levels can assist in alleviating concerns.

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<sup>21</sup> From British Standard BS5228-2:2009, Annex B; Refer Category A criteria in Section 2.2, Construction Noise and Vibration Assessment (Technical Report).

<sup>22</sup> From DIN 4150-3:1999. Refer Category B criteria in Section 2.2, Construction Noise and Vibration Assessment (Technical Report).

<sup>23</sup> Refer Section 8.3, Construction Noise and Vibration Assessment (Technical Report).

- 9.13 Overall, with good communication and appropriate choice of construction methodology, equipment, and monitoring, the relevant construction vibration criteria can be complied with at all dwellings.

## **10 Albany Busway changes**

- 10.1 After the notices of requirement and resource consent applications were lodged, the Project Team suggested repositioning the Albany Busway bridge.<sup>24</sup>
- 10.2 I have considered whether this refinement changes the construction noise and vibration effects of the Project (compared to the assessment by the Technical Report). The proposed busway overbridge and link road is in the order of 140 metres or greater from the closest dwelling. In my view the construction noise and vibration effects for the bridge can be managed and mitigated using the same methods as for in the previous location. I conclude the proposed design change will result in an insignificant change to construction noise and vibration levels.

## **11 Construction Noise and Vibration Management and Mitigation**

- 11.1 Construction activity is inherently noisy and can cause vibration levels not normally felt.
- 11.2 In my opinion, a Construction Noise and Vibration Management Plan ('**CNVMP**') that provides details on a methodology for proactively avoiding, or responding in a timely manner to, any noise and vibration issues, will be an essential tool for management and mitigation. The CNVMP will be a flexible document that can be adjusted and improved as construction progresses and details change, as is the case in any large scale construction project. The framework of the CNVMP would enable the construction team to take ownership of the noise issues that may arise.

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<sup>24</sup> Refer section 7 of Mr Moore's evidence in chief; and section 12 of Mr Bray's evidence in chief. The change to the busway overbridge alignment will reduce the length of the proposed bridge. Instead of the bridge spanning the busway carpark, the bridge will now adjoin the bus terminal road on the northern side of the carpark.

- 11.3 The Transport Agency Guide (from which the Project vibration criteria have been adopted) also includes information on the recommended content of CNVMPs and management and mitigation measures.<sup>25</sup> This guide is a useful tool when preparing a CNVMP and developing appropriate measures prior to and during construction because it contains case studies where CNVMPs have been successfully implemented.
- 11.4 I note that the proposed designation conditions include provision for both an overarching CNVMP (Condition CNV.1) and specific management schedules (Condition CNV.7)<sup>26</sup> where full compliance with the relevant construction noise or vibration criteria cannot practicably be achieved. I consider that this framework of management plans is appropriate and would ensure that individual effects are effectively responded to.

## 12 Comments on submissions

- 12.1 I have reviewed the submissions received, with a particular focus on submissions citing acoustic issues. Of the thirty-three submissions received, eight contain noise and vibration concerns, and of those, six submissions relate to construction noise or vibration. I address these submissions below.

### *Auckland Council*

- 12.2 Auckland Council (**'Council'**) provided an extensive submission. I had not had any discussions with Council or its acoustical expert prior to receiving the submission. Several of the points could have been addressed in my report or in discussion, if this opportunity had been available.
- 12.3 Council agrees on several points of my recommendations, including the application of the various acoustical standards, that a CNVMP is an appropriate measure to manage construction noise and that major construction works have the potential to generate significant construction effects.

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<sup>25</sup> Refer Section 8.2, Construction Noise and Vibration Assessment (Technical Report) and <https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/technical-disciplines/noise-and-vibration/standards-guidelines-and-specifications/>

<sup>26</sup> Appendix A Proposed Conditions, Refer AEE.

- 12.4 For ease of reference, I respond to Council's submission points of disagreement or outstanding information by labelling them as per the submission.
- 12.5 **6.1.1 Calculation of activity sound power levels for construction activities** questions why the activity sound power level is in some instances lower than the individual sound power levels of the equipment operating. The activity sound power level is a hypothetical level, assuming the percentage of "time on" of equipment, the fact that these activities operate over an area rather than as a "point" and that large pieces of equipment provide shielding to each other.
- 12.6 In reality, as shown many times during measurement, the distances shown in the figures in Appendix E of the Technical Report are conservative. Measured noise levels are generally lower than predicted due to terrain and intervening structures, while close measurements are affected by only one piece of equipment.
- 12.7 **6.1.2 Evidence base for assessment of construction noise** questions how often and to what level people and buildings will be exposed to noise levels in excess of the criteria. In addition, Council notes that  $L_{Amax}$  levels have not been predicted.
- 12.8 Council seeks that this information is provided in the CNVMP. I agree that such information should be included in the CNVMP or the schedules (as not all activities, durations and equipment will be known at the time the CNVMP is produced when a contractor is appointed).
- 12.9 It is not possible to predict in advance, at the current stage of the Project, the frequency or duration of any potential exceedance of the noise criteria. In order to provide this information, I would require detailed knowledge of the type and number of equipment operating, the time and duration of works and the mitigation implemented.
- 12.10 I note that the construction noise contours shown in figures in Appendix E of the Technical Report represent worst case situations. For instance, the blue "night-time" contour of the 45 dB  $L_{Aeq}$  noise limit extends significantly

on both sides of SH1 and SH18. This contour is not intended to show that there will be night-time noise everywhere along the Project and for all nights. Rather, it shows that if the contractor would choose to undertake night-time works, these are the dwellings that would need to be considered through communication and mitigation.

- 12.11 In reality, night-time works will likely be restricted to the bridge installations across SH1 and SH18 (due to full road closures) for about two or three nights per bridge. Other works that may need to be undertaken at night-time include vegetation removal from beside SH1 or SH18, and potentially some surfacing.
- 12.12 Therefore, the information provided in both Appendices E and F of the Technical Report needs to be interpreted with these restrictions in mind.
- 12.13 Council also seeks that dwellings and sensitive receivers that may be exposed to noise levels above 45 dB  $L_{Aeq}$  at night be protected by temporary or permanent noise barriers or have double glazing and ventilation installed prior to construction.
- 12.14 I agree that permanent traffic noise barriers should be installed as early as practicable to provide mitigation of construction noise also. However, where these barriers need to be installed on retaining walls or other works are required prior to their installation, this will not be practicable. Proposed Condition CNV.4 requires that: *“The CNVMP shall identify which mitigation measures required by conditions ON.1 to ON.14 imposed on the designations for the Project would also attenuate construction noise. Where practicable, those measures shall be implemented prior to commencing major construction works that generate noise in the vicinity.”*<sup>27</sup>
- 12.15 I agree that temporary barriers should be used where practicable. I have recommended this in my Technical Report. However, in many instances

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<sup>27</sup> Refer Appendix A – Proposed Conditions, AEE.

(e.g. at McClymonts Road, where dwellings are multi storey) a temporary barrier would be impracticable.

- 12.16 I disagree with the provision of double glazing and ventilation for any exceedance of the 45 dB  $L_{Aeq}$  night-time noise limit for the following reason. Table 3 of the Technical Report sets out the current ambient night-time noise levels at the measurement positions.<sup>28</sup> In all instances, the existing noise levels are higher than 45 dB  $L_{Aeq}$ . It is unreasonable and unnecessary to require such involved mitigation as double glazing and ventilation for temporary exceedance of the limits. There are many more appropriate management measures, first of all being consultation and communication with affected residents.
- 12.17 I note that if Council was to request such mitigation for all projects across Auckland, no roading project (including Council roads) could be constructed at night-time. I also note that the AUP makes provision for the exceedance of daytime and night-time construction noise limits for construction in roads when a CNVMP has been prepared.<sup>29</sup> The pragmatic and appropriate response should be applied to any exceedance of limits, in my opinion.
- 12.18 In regards to the prediction of  $L_{Amax}$  noise levels, these cannot be predicted with sufficient certainty to be reported. Maximum noise levels are dependent on a number of extraneous factors, for instance operator skill, a dropped tool or a stone getting caught in a bulldozer track. I note that British Standard BS5228-1:2009 does not provide maximum noise levels for equipment either. An earlier version of this standard is referenced in NZS 6803:1998. This supports my opinion that a prediction of maximum noise levels is futile and would suggest an accuracy that is not in fact present.
- 12.19 For all construction projects that I have been involved in, I have not provided a prediction of the maximum noise levels for those reasons.

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<sup>28</sup> Refer Section 4.0, Construction Noise and Vibration Assessment (Technical Report).

<sup>29</sup> AUP, E25.6.29. Construction noise levels for work within the road.

- 12.20 **6.1.3. Effects of construction vibration** states that the vibration assessment is not sufficiently detailed. It seeks that the Construction Environmental Management Plan (**'CEMP'**) and CNVMP be approved by Council.
- 12.21 I am unsure how the approval of the CNVMP would alleviate Council's concern in regards to vibration effects. However, I note that the Technical Report states a pre-construction building condition survey should be undertaken at all buildings in the high vibration risk zone.<sup>30</sup>
- 12.22 Also, proposed condition CEMP.1 requires the submission of the CEMP (which includes the CNVMP) to Council for certification.<sup>31</sup>
- 12.23 Council questions "*which party is responsible for repairing damage caused by vibration.*" I note that proposed condition CNV.8 states that "*If any vibration-induced damage is shown to have occurred as a result of Project construction activities, any such damage shall be remedied by the Consent Holder.*"<sup>32</sup>
- C Syddall*
- 12.24 Mr Syddall is the owner of two business premises adjacent to SH1, one of which he occupies. He is concerned about adverse construction noise and vibration effects.
- 12.25 I understand that Mr Syddall's premises are at Titoki Place, with the buildings between approximately 29 and 32 metres from the near edge of the carriageway. The additional lane would bring the road closer by 5 to 6 metres. Construction may occur as close as 16 to 18 metres from the façade of the building.
- 12.26 The building is identified in Appendix E of the Technical Report as likely to receive noise levels exceeding both daytime and night-time criteria at times of high noise generating activities.

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<sup>30</sup> Refer Section 8.3, Construction Noise and Vibration Assessment (Technical Report).

<sup>31</sup> Refer Appendix A – Proposed Conditions, AEE.

<sup>32</sup> Refer Appendix A – Proposed Conditions, AEE.



- 12.27 I have discussed the general effects of construction noise and vibration in detail in my report. It is important to note that construction works generally have more significant impacts than ongoing activities, but are of finite duration, and generally in close proximity for a limited time only.
- 12.28 The premises of Mr Syddall are within the medium vibration risk radius with the assumed construction methodology and equipment,<sup>33</sup> therefore a building condition survey is recommended, which will ensure that any potential damage caused by construction activities can be rectified following the works.
- 12.29 Construction noise may be disturbing at times, even for a business. However, the duration of this disturbance would be limited.
- 12.30 Potential mitigation measures may include the placement of a temporary barrier (which is not sought by the submitter so that visibility of the business is retained). Other options to manage acoustic effects, if practicable, include works at night-time, when premises are unoccupied, the offer of a building condition survey prior to high vibration generating activities and ongoing communication and consultation.
- 12.31 These measures would be anchored in the CNVMP that is proposed in Conditions CNV.1 to CNV.4.<sup>34</sup>

*V Wills (Meadowood Community Crèche)*

- 12.32 The submission on behalf of the Meadowood Community Crèche raises concerns about increases in noise and vibration levels due to the construction of the Project.
- 12.33 I acknowledge that construction noise may cause adverse effects on the operation of the crèche as daytime noise limits are high in order to enable construction to be undertaken. This may interfere with activities such as sleeping or outdoor play.

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<sup>33</sup> Shown in Construction Noise and Vibration Assessment (Technical Report), Appendix F.

<sup>34</sup> Refer Appendix A – Proposed Conditions, AEE.

- 12.34 Management of construction effects needs to take account of the receiving environment. This means that consultation with the surrounding residents and businesses will establish what problems may be encountered, and management and mitigation implemented accordingly.
- 12.35 I note that large infrastructure projects are often constructed in the vicinity of noise sensitive areas, including educational facilities.<sup>35</sup> The Transport Agency has experience with these projects and is, in my opinion, able to address effects appropriately as needed. Such mitigation includes communication and consultation with affected stakeholders, temporary barriers if effective, timing of works to outside sleep or teaching hours if practicable, the choice of construction methodology and equipment and avoidance of unnecessary noise (e.g. avoiding the use of truck horns and always securing tail gates).

*Flourishing Property Company Ltd*

- 12.36 The submitter is the owner of the site at 113 McClymonts Road. The site is currently vacant and no details about future use are publicly available. The submitter is concerned about traffic noise effects on any potential future high density residential and mixed use development of the site.
- 12.37 The submission seeks that any construction noise effects on the site be managed to protect the residential use of the site.
- 12.38 Construction noise is assessed at buildings and dwellings that exist at the time of construction. If the site is still vacant, or being constructed on, during the construction of the Project, then there would be no effects that need to be managed. However, if the site is developed and inhabited by the time the Project is constructed, then construction effects on the buildings will be managed and mitigated as for any other site along the Project.
- 12.39 Construction noise and vibration management will be specified when a contractor has been appointed and more detail about construction

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<sup>35</sup> For instance the Waterview Connection was constructed adjacent to Waterview Primary School.

(including timing) is known.<sup>36</sup> I consider that this should alleviate the submitter's concern.

*TK Yen*

- 12.40 Mr and Mrs Yen live at 13 Wren Place, Unsworth Heights. They are concerned about noise during construction, and seek temporary relocation during the construction phase.
- 12.41 The dwelling at 13 Wren Place is in close proximity to retaining wall works (approximately 8 metres) and in the vicinity of the works associated with the new Paul Matthews Road bridge (approximately 80 metres).
- 12.42 During vibro-compaction, the dwelling falls into the high risk vibration zone, as set out in Appendix F2 of the Technical Report. Therefore, a building condition survey will be recommended prior to these works, and measurement of vibration levels may be required during high vibration works.
- 12.43 I understand that the retaining wall works will not involve piling. Should piling be required, then a building condition survey would be required due to the close distance to the dwelling.
- 12.44 The submitters have installed double glazing to reduce noise levels. This will also benefit them during construction, when external noise levels will be high at times.
- 12.45 A 3 metre high traffic noise barrier is recommended to be installed outside their dwelling. This barrier would need to be installed on the retaining wall, so cannot be installed prior to construction works. However, I recommend that as soon as practicable, the traffic noise barrier is installed so that it also provides construction noise mitigation.

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<sup>36</sup> Refer Section 8.1, Construction Noise and Vibration Assessment (Technical Report).

12.46 I do not consider that temporary relocation for the duration of construction is necessary. With appropriate management and mitigation, construction noise and vibration levels can be controlled to a reasonable level.

*Kiwi Self Storage Ltd*

12.47 Kiwi Self Storage Ltd operates at 6 Miro Place, Albany. The submitter is concerned about construction noise effects on the site manager, who lives on-site.

12.48 The accommodation is located some 55 metres from the closest construction activities (the proposed swale) and approximately 70 metres from the closest road construction.

12.49 Since the building is a residence, it will be assessed in the same way as any other dwelling along the Project, and management and mitigation of construction noise will be required to achieve compliance with the relevant limits. I consider that at the distances noted above, compliance with the relevant noise limits can be achieved.

*Watercare Services Ltd*

12.50 Watercare Services Ltd operates the Rosedale wastewater treatment plant and is concerned about construction effects (including potentially vibration) on its infrastructure, particularly the Wairau Valley Sewer and East Coast Bays Branch Sewer.

12.51 I consider that vibration criteria for services can be included in the conditions, e.g. CNV.6. Table 2 of DIN 4150-3<sup>37</sup> gives guideline values for evaluating the effects of vibration on buried pipework (in mm/s PPV). In my view, these guidelines provide appropriate limits for the protection of Watercare infrastructure. The following table shows the relevant criteria.

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<sup>37</sup> DIN 4150-3:1999 "Structural Vibration – Part 3 – Effects of vibration on structures", referenced in the Auckland Unitary Plan.

Line	Pipe material	Guideline values for PPV measured on the pipe, in mm/s
1	Steel (including welded pipes)	100
2	Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
3	Masonry, plastic	50

### 13 Response to section 149G(3) key issues report

13.1 The Section 149G Key Issues Report discusses construction noise and vibration issues at paragraph 141. The report references the objectives and policies of the AUP relating to construction noise and vibration. I respond to each of these points below.

13.2 Objective 25.2.4 states that:

*(4) construction activities that cannot meet noise and vibration standards are enabled while controlling duration, frequency and timing to manage adverse effects.*

13.3 My assessment in the Technical Report discusses in detail the locations where exceedance of the noise and/or vibration criteria may occur, and provides options for noise and vibration management and mitigation, which will be refined when a contractor has been appointed.

13.4 I consider that my assessment fulfils the requirements of the above objective.

13.5 The Section 149G report also considers the following policies from E25.3 to be a key issue in relation to construction noise and vibration:

*(2) Minimise, where practicable, noise and vibration at its source or on the site from which it is generated to mitigate adverse effects on adjacent sites.*

*(10) Avoid, remedy or mitigate the adverse effects of noise and vibration from construction, maintenance and demolition activities while having regard to:*

*(a) the sensitivity of the receiving environment; and*

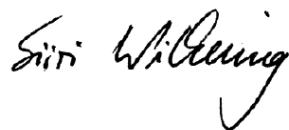
*(b) the proposed duration and hours of operation of the activity; and*

*(c) the practicability of complying with permitted noise and vibration standards*

- 13.6 The intention of both policies is fulfilled, in my opinion, with the recommendations set out in the Technical Report in Section 8.2. My assessment has considered the sensitivity of the receiving environment (e.g. whether residential or commercial use). I have also considered the likely timing and duration of construction activities (e.g. bridge works carried out during the night).
- 13.7 The bullet points of hierarchy of mitigation in Section 8.2 set out mitigation options from managing timing of construction works, selecting low noise equipment and methodologies to reduce noise (and vibration) on site, and providing barriers where practicable. Vibration management and mitigation is set out in Section 8.3 of the Report and also focuses on the choice of low vibration plant and techniques and managing timing.
- 13.8 As for most large infrastructure projects, full compliance with the construction noise and vibration criteria is not practicable in all instances. However, compliance with the relevant limits is recommended where this can be practicably achieved, and where this is not practicable, management and mitigation are recommended.

## 14 Conclusions

- 14.1 Together with my colleagues at MDA, I have assessed the Project's potential construction noise and vibration effects. Construction noise criteria are generally less stringent than those for ongoing activities, but allow for rest periods at night-time and Sundays. My assessment and recommended criteria are based on the current New Zealand construction noise standard (NZS 6803:1999).
- 14.2 Night-time works will be required at times to avoid disruption to traffic on SH1 and SH18. These works, and some daytime works, are likely to exceed the relevant noise criteria.
- 14.3 Based on predicted distances beyond which the vibration criteria can be complied with, most works will be able to be undertaken in compliance with the relevant criteria.
- 14.4 Any potential exceedances of the recommended criteria and associated effects on dwelling and businesses can be managed and mitigated through a CNVMP. A CNVMP has the advantage of being a flexible tool that can be adjusted as construction progresses to address specific practices and related impacts. I therefore consider that it is the most appropriate instrument to respond in a proactive manner to any potential construction noise issue.
- 14.5 I consider that the conditions provide appropriate management and mitigation methodologies for the construction of this Project.



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**Siiri Wilkening**

20 April 2017