

Before the Board of Inquiry
Waterview Connection Project

in the matter of: the Resource Management Act 1991

and:

in the matter of: a Board of Inquiry appointed under s 149J of the Resource Management Act 1991 to decide notices of requirement and resource consent applications by the NZ Transport Agency for the Waterview Connection Project

Supplementary evidence by Siiri Wilkening on behalf of the **NZ Transport Agency** in response to Board's request concerning construction noise

Dated: 28 February 2011

REFERENCE: Suzanne Janissen (suzanne.janissen@chapmantripp.com)
Cameron Law (cameron.law@chapmantripp.com)

Chapman Tripp
T: +64 9 357 9000
F: +64 9 357 9099

23 Albert Street
PO Box 2206, Auckland 1140
New Zealand

www.chapmantripp.com
Auckland, Wellington,
Christchurch



INDEX

INTRODUCTION2

PURPOSE OF SUPPLEMENTARY EVIDENCE2

RESPONSE TO BOARD REQUEST3

FURTHER ISSUES RAISED BY THE BOARD5

ANNEXURE A: CONSTRUCTION NOISE LEVEL PREDICTIONS BY SECTOR AND ACTIVITY 9

ANNEXURE B: ADDITIONAL SECTIONS TO BE INCLUDED IN THE CONSTRUCTION NOISE AND
VIBRATION MANAGEMENT PLAN (CNVMP)17

ANNEXURE C: SUMMARY PROCESS FOR CONSTRUCTION ACTIVITIES AND NOISE
ASSESSMENT/MITIGATION RESPONSE (FLOWCHART).....19

**SUPPLEMENTARY EVIDENCE BY SIIRI WILKENING ON BEHALF OF
THE NZ TRANSPORT AGENCY IN RESPONSE TO BOARD'S REQUEST
CONCERNING CONSTRUCTION NOISE**

INTRODUCTION

- 1 My full name is Siiri Wilkening. I refer the Board of Inquiry to the statement of my qualifications and experience set out in my evidence in chief (*EIC*) (dated 10 November 2010).
- 2 I repeat the confirmation given in that statement that I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court.

PURPOSE OF SUPPLEMENTARY EVIDENCE

- 3 This evidence responds to the written request made by Board of Inquiry (Board) member Mr Alan Dormer on 17 February 2011 concerning construction noise.
- 4 The Board's request reads as follows:

The operational noise conditions include an anticipatory / predictive component such that at risk properties are identified in advance, and mitigation works proposed / installed before effects felt. That might be a helpful starting point [for construction noise], particularly in relation to those properties that can be expected to experience noise at non complying levels over maybe 5-6 years of construction activity. It seems to us that we can say now that certain activities will breach noise levels that will particularly affect certain properties and that those can be identified in advance. So at least for some of those subject to construction effects there has to be some potential for early mitigation.

The Board seeks Ms Wilkening's further help in construction noise. Can she compile:

1. A list of activities which will not comply with limits.
 2. Perhaps divide that list into:
 - (a) Construction effects of greater than 2 weeks duration;
 - (b) Shorter term construction effects.
 3. A map or plan showing properties likely to be subject to noise above levels specified.
- 5 This evidence also responds to other queries made by the Board during the hearing, in particular in relation to the wording and practical implementation of the proposed Construction Noise and Vibration (CNV) conditions.

RESPONSE TO BOARD REQUEST

- 6 As background to my response to Questions 1 and 2 from the Board, I refer to my Technical Report G.5 (Assessment of Construction Noise Effects).¹ In Section 8 is a sector by sector assessment of construction noise effects, specifying the activities assessed and mitigation proposed.

Question 1

- 7 From the tables in Section 8 of the Report, I have extracted those activities that are likely to exceed the construction noise criteria, if they were undertaken without the implementation of mitigation measures. These are shown in tables in **Annexure A** to this evidence.
- 8 The relevant noise criteria for the various activities listed in the tables are set out in proposed conditions CNV.2(a) and (b). For ease of reference they are included in the tables in Annexure A.
- 9 For each sector where the potential for noise criteria exceedance has been identified, the tables in **Annexure A** list:
- 9.1 **Activity** (Column 1) – the overall activity to be undertaken.
- 9.2 **Noisiest equipment** (additional equipment may be used) (Column 2) – representative noisiest potential equipment required to complete the activity in Column 1. (Further equipment will be used and is shown in Section 8 of Technical Report G.5.)
- 9.3 **Estimated total duration** (Column 3) – the estimated total duration of the activity. This does not mean that the activity will be carried out continuously over this period. In most circumstances, except for the construction yards and batch plants, the activities will be undertaken for limited times within the overall period.
- 9.4 **Closest receivers** and minimum estimated distance from works (Column 4).
- 9.5 **Noise level at closest receiver without mitigation:** Maximum average (Column 5) – predicted noise level from a reasonable combination of equipment operating at the closest distance from the receiver location. This noise level does not include any mitigation.
- 9.6 **Exceeds daytime criterion** (Column 6) – Denotes if the relevant daytime noise criterion is likely to be exceeded without the implementation of mitigation.

¹ Assessment of Environmental Effects (AEE), Part G.

9.7 **Exceeds night-time criterion** (Column 7) – Denotes if the relevant night-time noise criterion is likely to be exceeded without the implementation of mitigation. If no night-time works are proposed, this is denoted with N/A.

9.8 **Potential mitigation option** (Column 8) – suitable mitigation options. These are examples and will be refined by the contractor, once appointed. The final mitigation option chosen will be dependent on the actual equipment to be used and timing of activities.

Question 2

10 The tables in Annexure 2 identify (in the 3rd Column) the “estimated total duration” of the activity. The duration of each activity varies from a few weeks to several months. However, I note that in most instances construction would not be undertaken continuously over the entire duration set out in the tables but would be intermittent while moving along the alignment. As a result, construction noise would affect each property for a limited time only.

11 As an example, the road milling, construction and resurfacing in Sector 1² would not occur continuously for 12 months during daytime and night-time. Rather, these activities would occur on either the eastbound or westbound lanes and at different locations along Sector 1 during that 12 months period.

12 Beyond these broad and indicative timeframes, it is not possible to provide plans showing the extent of potential exceedance at this time (such planning will need to be integrated with other construction activities, traffic management and other factors.) However, the tables in Annexure A indicated the most affected positions (in the 4th Column.) Other receivers at greater distances will receive lower noise levels due to distance attenuation and shielding. Any noise mitigation measure implemented for the most affected dwelling will also benefit other dwellings in the vicinity.

Question 3

13 The Expert Caucusing Joint Report to the Board (Noise) contains a set of plans showing those dwellings which are located within 100 metres of the surface construction site.³ These dwellings are intended to be notified of any night-time works in the vicinity of the dwellings, as set out in proposed Condition CNV.1(b)(xi).

14 Providing further maps or plans showing properties likely to be subject to levels above the noise criteria would not be possible at this stage of the Project as the specific choice of equipment and timing of works cannot be determined until a contractor has been appointed. Nevertheless, I note that the most affected properties in

² Technical Report G.5, Table 8.1, pg. 26.

³ Expert Caucusing Joint Report to the Board of Inquiry – Topic Noise, Annexure A (Drawings GIS-3814238-421-1 to 6).

each Sector are broadly identified in Column 4 in the tables in **Annexure A**.

- 15 I note that dwellings not immediately facing the construction works (e.g. those in the second row), would receive shielding from those dwellings fronting the construction site.
- 16 In addition to distance attenuation of noise and the shielding afforded by intermittent structures, site specific noise mitigation (such as the installation of construction noise barriers) will further reduce noise levels for those dwellings.

FURTHER ISSUES RAISED BY THE BOARD

- 17 During the hearing, a number of questions from the Board have been raised concerning who determines what is "practicable" in terms of achieving construction noise criteria and how potential exceedance of these criteria will be determined and responded to.⁴
- 18 Construction noise from large roading projects will inherently exceed construction noise criteria from time to time. The nature of these projects - i.e. moving along an extended alignment, often in close proximity to existing dwellings, and the need for large construction and earthmoving equipment to operate over an extensive area - causes intermittent high noise levels in the vicinity. The size of equipment and construction area does not permit effective localised shielding of equipment, as would be the case for contained construction activities which are restricted to one location (e.g. construction of a building). That is a practical reality. As a consequence, it is long accepted good practice to provide an appropriate mechanism to respond practicably to circumstances where there will likely be exceedances.
- 19 As a practical matter, and as occurs on all large roading projects so far as I am aware, any potential exceedance of the construction noise criteria and mitigation required will be determined by the contractor. This is because the contractor is in control of the construction site, the equipment to be used and activities to be undertaken and can therefore respond to any noise issue that may arise from the construction site. The Construction Noise and Vibration Management Plan (CNVMP)⁵ contains processes on how to assess construction noise on a day-to-day basis, schedule works and equipment and implement mitigation in order to achieve the most effective and practicable outcome for all affected parties.⁶ Roles and

⁴ For example, Transcript at pages 270 – 273 (where I gave examples of where it may not be practicable to comply with the noise criteria), and pages 401 – 404 (where Member Dormer questioned who decides what is practicable, who decides which alternative mitigation measures might be most appropriate and when are these decisions made).

⁵ Technical Report G.5, Annexure C: Construction Noise and Vibration Management Plan.

⁶ Technical Report G.5, Annexure C: Construction Noise and Vibration Management Plan, Sections 8 to 11.

responsibilities of site personnel are set out in the CNVMP in Section 7, Table 7.1.

- 20 Other large infrastructure projects in Auckland in which I have been involved (such as the Vic Park Tunnel project), use a methodology of determining in advance, and responding to, potential non-compliance with the noise criteria. Similar methodologies are proposed by the NZTA for the Waterview Project.
- 21 For the Vic Park Tunnel project, the environmental site manager determines, by calculation, the noise levels for each planned activity. Tools (such as the construction noise calculator provided online by the NZTA⁷) are used to predict those noise levels and determine in advance if noise criteria may be exceeded.
- 21.1 In the event of compliance being predicted, the activity goes ahead and normal monitoring is undertaken.⁸
- 21.2 In the event of non-compliance being predicted, a Site Specific Noise Management Plan (SSNMP) would be prepared which includes discussion of the activity, equipment, duration and timing, location, predicted noise levels and investigated mitigation measures.
- 22 Standard forms for a SSNMP are provided on the NZTA website and provide a framework of required content to the contractor (as set out in paragraph 21.2 above).⁹
- 23 The Draft CNVMP for the Waterview Project did not include the provision of a SSNMP.

Amendments proposed to the CNVMP

- 24 To provide greater clarity and certainty as to what process will be followed in the event of non-compliance being predicted for the Waterview Project, I recommend that a SSNMP process be used. As a result, **Annexure B** of this evidence contains a new section which I recommend to be included in the CNVMP which sets out the process once potential non-compliance with the construction noise criteria has been determined.
- 25 In summary, once potential non-compliance with the noise criteria has been determined for a construction activity for Waterview, a process involving the contractor, the Council and affected residents would be invoked. The Council will be notified of, and involved in processes relating to, potential non-compliance. Affected residents will be involved in any processes which involve mitigation outside the designation and where full compliance cannot be achieved at all times.

⁷ <http://acoustics.nzta.govt.nz/node/add/calc-construction-sound>.

⁸ As set out in the Construction Noise and Vibration Management Plan, Section 9.

⁹ <http://acoustics.nzta.govt.nz/approaches-to-noise-management/management-plans>.


- 26 The process to be followed in this circumstance involves the preparation of a SSNMP which requires the contractor to assess potential mitigation options and their effectiveness. The outcome of this assessment will be a practicable mitigation option which, when implemented, will achieve a suitable outcome for both the affected residents and the contractor.
- 27 The practicability of mitigation measures will be determined in a hierarchy as follows.
- 27.1 Confirmation that construction during sensitive times (e.g. night-time) is absolutely necessary;
- 27.2 Choice of equipment, giving preference to low noise generating equipment and processes where these are practical alternatives;
- 27.3 Using temporary construction noise barriers within the designation, designed to break acoustic line-of-sight from the construction activity to the receiver;
- 27.4 Sequencing of works (e.g. taking account of school holidays or avoiding several nights' work in the same location);
- 27.5 Temporary relocation of residents to appropriate alternative accommodation during events of limited duration (e.g. several nights of high noise generating works);
- 27.6 Building envelope improvements (e.g. installation of alternative ventilation in order to permit residents to keep their windows closed, improvements of glazing or installation of door and window seals) in response to ongoing construction noise (e.g. the operations of the batch plant in Sector 9, where I have recommended the installation of alternative ventilation for houses in the vicinity).¹⁰
- 28 The Council will be asked to certify that the above process has been followed by the contractor.
- 29 This process is set out in the flow diagram in **Annexure C** of my evidence (headed "Summary Process for Construction Activities and Noise Assessment/Mitigation Response"). I propose that this diagram should replace the current flow diagram in Appendix D of the Draft CNVMP.
- 30 I understand that proposed condition CNV.1 will be amended so as to require that the SSNMP process will be used for the Waterview Project.
- 31 In my experience with previous projects I have been involved with, responses from affected residents to different forms of mitigation

¹⁰ A figure showing the indicative extent of houses which would be treated is contained in Appendix E of the Draft CNVMP.

proposed have varied. In some instances, residents have welcomed the possibility of relocation, while in other instances residents have preferred to remain in their own houses and received mitigation in another form. Both responses have been received for the Vic Park Tunnel project. In another instance (for the North Shore Busway project), residents of a retirement village indicated that they preferred that no construction noise barrier be installed in order to retain visibility to the construction site and State highway.

- 32 Where the implementation of extensive mitigation is practicable (e.g. for long duration construction noise in one location), this will also be considered. For example, at Vic Park Tunnel a substantial barrier of approximately 5 metres high was installed at the Weld Street apartment blocks. These barriers comprise a significant structure to the roof height of the buildings and have proven to be highly effective in mitigating ongoing construction noise.

Dated: 28 February 2011


Siiri Wilkening

ANNEXURE A: CONSTRUCTION NOISE LEVEL PREDICTIONS BY SECTOR AND ACTIVITY

Excerpt from Technical Report G.5 'Assessment of Construction Noise Effects', Section 8

Only those activities potentially exceeding the construction noise criteria have been included in these tables. Shaded cells indicate that noise mitigation will be required in order to manage noise effects and, as far as practicable, achieve compliance with the relevant criteria.

Sector 1

Activity	Noisiest Equipment	Est. total duration	Closest receivers	Noise level at closest receiver w/o mitigation $L_{Aeq(t)}$ dB	Exceeds daytime criterion 70 dB L_{Aeq}	Exceeds night-time criterion 60 dB L_{Aeq}	Potential mitigation option
Retaining walls and filling for widening	Hydraulic excavator Concrete vibrator	~12 months	Patton Ave (~20m), Marewa St (~20m), Titoki St (~25m).	76	Yes	N/A	<ul style="list-style-type: none"> ○ temporary construction noise barriers ○ choice of low noise equipment
Road milling	Road Milling Machine	~12 months	Milich Tce (~25m) and McCormack Rd (~25m)	71	Yes	Yes	<ul style="list-style-type: none"> ○ installation of traffic noise barriers shall be programmed for construction early in the construction period, if practicable. ○ temporary construction noise barriers
Road construction and surfacing	Asphalt paver Concrete vibrator	~12 months	Milich Tce (~25m) and McCormack Rd (~25m)	81	Yes	Yes	<ul style="list-style-type: none"> ○ installation of traffic noise barriers shall be programmed for construction early in the construction period, if practicable. ○ localised screening around noisy equipment or screening at property boundaries
Noise barrier construction	Vibration piling rig Auger drilling rig	< 4 weeks	Milich Tce, Patton Ave (~10m).	86	Yes	N/A	<ul style="list-style-type: none"> ○ notification and consultation
Cut-and-cover construction	Vibration piling rig Auger drilling rig	~12 months	Titoki St (~40m)	74	Yes	N/A	<ul style="list-style-type: none"> ○ construction should be performed underneath the cover as early on in the construction period as possible ○ excavation should be performed from underneath the capping, if practicable.

Sector 3

Activity	Noisiest Equipment	Est. total duration	Closest receivers	Noise level at closest receiver w/o mitigation $L_{Aeq(t)}$ dB	Exceeds daytime criterion 70 dB L_{Aeq}	Exceeds night-time criterion 75 dB L_{Aeq}	Potential mitigation option
Pad footing construction or pier construction	Drill Rig Concrete Vibrator Excavator	~6 months	Rosebank Industrial estate (~15m)	80	Yes	Yes	<ul style="list-style-type: none"> ○ schedule works for night-time ○ temporary construction noise barriers ○ localised screening around noisy equipment or screening at property boundaries
Precast segment delivery, launching or craning of segments into place, installation and tensioning of segments	Hydraulic jacks Grinder Concrete vibrators	~6 months	Rosebank Industrial estate (~15m)	75	Yes	No	<ul style="list-style-type: none"> ○ schedule works for night-time ○ temporary construction noise barriers ○ localised screening around noisy equipment or screening at property boundaries
Span finishing and barrier installation (if required, refer traffic noise assessment)	Grinder Jack hammer	~6 months	Rosebank Industrial estate (~15m)	75	Yes	No	<ul style="list-style-type: none"> ○ schedule works for night-time ○ temporary construction noise barriers ○ localised screening around noisy equipment or screening at property boundaries
Surfacing	Asphalt spreader	~6 months	Rosebank Industrial estate (~15m)	73	Yes	No	<ul style="list-style-type: none"> ○ schedule works for night-time ○ temporary construction noise barriers ○ localised screening around noisy equipment or screening at property boundaries

Sector 5

Activity	Noisiest Equipment	Est. total duration	Closest receivers	Noise level at closest receiver w/o mitigation $L_{Aeq}(t)$ dB	Exceeds daytime criterion 70 dB L_{Aeq}	Exceeds night-time criterion 60 dB L_{Aeq}	Potential mitigation option
Contiguous bored piling	Vibration piling rig Drilling rig	~8 months	Waterbank Cres (Ramp 2 ~ 60m) Montrose St (Ramp 4 ~ 60m)	70	No	Yes	<ul style="list-style-type: none"> ○ schedule works to be distant from residences at night-time ○ temporary construction noise barriers
Pad footing construction or pier construction	Drill Rig Rock Breaking	~16 months	Waterbank Cres (Ramp 2 ~ 60m) Montrose St (Ramp 4 ~ 60m)	74	Yes	Yes	<ul style="list-style-type: none"> ○ schedule works to be distant from residences at night-time ○ temporary construction noise barriers ○ no rock breaking at night time
Precast segment delivery, launching or craning of segments into place, installation and tensioning of segments	Grinder Concrete vibrators	~16 months	Waterbank Cres (Ramp 2 ~ 60m) Montrose St (Ramp 4 ~ 60m)	66	No	Yes	<ul style="list-style-type: none"> ○ schedule works to be distant from residences at night-time ○ schedule noisy works for daytime only
Span finishing	Grinder Jack hammer	~8 months	Waterbank Cres (Ramp 2 ~ 60m) Montrose St (Ramp 4 ~ 60m)	66	No	Yes	<ul style="list-style-type: none"> ○ schedule works to be distant from residences at night-time ○ schedule noisy works for daytime only
Surfacing	Asphalt spreader	~8 months	Waterbank Cres (Ramp 2 ~ 60m) Montrose St (Ramp 4 ~ 60m)	64	No	Yes	<ul style="list-style-type: none"> ○ schedule works to be distant from residences at night-time ○ schedule noisy works for daytime only
Yard 6 - Waterview Park. Tunnel Contractor Yard	Hydraulic excavator Concrete Batch Plant	5 years	Waterbank Cres (~50m)	68	No	Yes	<ul style="list-style-type: none"> ○ solid site hoarding acting as construction noise barrier ○ layout of yard to move noisy processes as far from residences as practicable

Sector 6

Activity	Noisiest Equipment	Est. total duration	Closest receivers	Noise level at closest receiver w/o mitigation $L_{Aeq(t)}$ dB	Exceeds daytime criterion 70 dB L_{Aeq}	Exceeds night-time criterion 60 dB L_{Aeq}	Potential mitigation option
Retaining wall structure (west bound)	Vibration piling rig Auger drilling rig Drilling rig	~8 months	Sutherland Road (25m)	78	Yes	N/A	<ul style="list-style-type: none"> ○ construction noise barrier ○ scheduling of works in consultation with residents
Construction of additional lanes	Rock Breakers/Picks Concrete vibrator Asphalt paver	~4 months	Sutherland Road (25m)	77	Yes	Yes	<ul style="list-style-type: none"> ○ construction noise barriers ○ scheduling of works in consultation with residents ○ temporary relocation
Noise barriers	Auger drilling rig Boom cranes	< 4 weeks	Suntherland Road (~10m)	82	Yes	N/A	<ul style="list-style-type: none"> ○ Notification and consultation
Yard 5- Meola Creek Road Builder Yard	Material handling	~12 months	Great North Road (~20m)	66	No	Yes	<ul style="list-style-type: none"> ○ solid site hoarding acting as construction noise barrier ○ layout of yard to move noisy processes as far from residences as practicable

Sector 7

Activity	Noisiest Equipment	Est. total duration	Closest receivers	Noise level at closest receiver w/o mitigation $L_{Aeq(t)}$ dB	Exceeds daytime criterion 70 dB L_{Aeq}	Exceeds night-time criterion 60 dB L_{Aeq}	Potential mitigation option
Great North Road realignment	Rock Breakers/Picks Concrete vibrator Asphalt paver	~4 months	Oakley Ave (~10m) Alford St (~10m)	85	Yes	Yes	<ul style="list-style-type: none"> ○ schedule works to be distant from residences at night-time ○ temporary construction noise barriers ○ temporary relocation
Retaining wall structure	Drilling rig	~16 months	Oakley Ave (~30m) Alford St (~30m)	74	Yes	Yes	<ul style="list-style-type: none"> ○ schedule works to be distant from residences at night-time ○ temporary construction noise barriers ○ temporary relocation
Excavation	Excavator	~8 months	Oakley Ave (~30m) Alford St (~30m)	72	Yes	Yes	<ul style="list-style-type: none"> ○ schedule works to be distant from residences at night-time ○ temporary construction noise barriers
Tunnel roof construction	Boom Crane	~8 months	Oakley Ave (~20m) Alford St (~20m)	73	Yes	Yes	<ul style="list-style-type: none"> ○ schedule works to be distant from residences at night-time ○ temporary construction noise barriers
Vent building	Soldier piling	~12 months	Oakley Ave (~20m)	80	Yes	Yes	<ul style="list-style-type: none"> ○ schedule works to be distant from residences at night-time ○ schedule noisiest work for daytime only ○ temporary construction noise barriers ○ temporary relocation
Yard 7 - Oakley Creek Reserve Tunnel Construction	Material handling	5 years	Alford Street (~50m)	65	No	Yes	<ul style="list-style-type: none"> ○ solid site hoarding acting as construction noise barrier ○ layout of yard to move noisy processes as far from residences as practicable

Sector 9

Activity	Noisiest Equipment	Est. total duration	Closest receivers	Noise level at closest receiver w/o mitigation $L_{Aeq(t)}$ dB	Exceeds daytime criterion 70 dB L_{Aeq}	Exceeds night-time criterion 45 dB L_{Aeq}	Potential mitigation option
Topsoil removal/site preparation	Excavators/face shovel	~1 month	Receivers south of Hendon Ave (~20m)	76	Yes	N/A	<ul style="list-style-type: none"> temporary construction noise barriers
Basalt rock breaking	Drilling rigs Rock breakers/picks Excavators/Face shovel	~6 months	Receivers south of Hendon Ave (~40m)	78	Yes	N/A	<ul style="list-style-type: none"> temporary construction noise barriers
Grout curtain	Pneumatic percussion drilling	~1 month	Receivers south of Hendon Ave (~20m)	84	Yes	N/A	<ul style="list-style-type: none"> temporary construction noise barriers specialised shielding of equipment (additional barriers)
Bridge pad spread footing construction or pier construction	Drill Rig Rock Breaking	~4 months	Richardson Rd and Valonia St (~80m)	62	Yes	Yes	<ul style="list-style-type: none"> no rock breaking and drilling at night times temporary construction noise barriers
Precast segment delivery, craning segments into place, installation and tensioning	Grinder Hydraulic jacks Concrete vibrators	~4 months	Richardson Rd and Valonia St (~80m)	64	No	Yes	<ul style="list-style-type: none"> temporary construction noise barriers schedule delivery for daytime
Span finishing and barrier installation (if required, refer traffic noise assessment)	Jack hammer Grinder	~4 months	Richardson Rd and Valonia St (~80m)	64	No	Yes	<ul style="list-style-type: none"> temporary construction noise barriers no jack hammering at night-time
Surfacing	Asphalt spreader	~1 months	Richardson Rd and Valonia St (~80m)	62	No	Yes	<ul style="list-style-type: none"> information and consultation with residents

Activity	Noisiest Equipment	Est. total duration	Closest receivers	Noise level at closest receiver w/o mitigation $L_{Aeq(t)}$ dB	Exceeds daytime criterion 70 dB L_{Aeq}	Exceeds night-time criterion 60 dB L_{Aeq}	Potential mitigation option
Yard 9 – Alan Wood Park Driven Tunnel Operation	Material handling	5 years	Hendon Ave (~20m) and Bollard Ave (~20m)	66	No	Yes	<ul style="list-style-type: none"> ○ solid site hoarding acting as construction noise barrier ○ layout of yard to move noisy processes as far from residences as practicable
Yard 10 – Driven Tunnel Operation Alan Wood Park	Concrete batch plant Material handling	5 years	Methuen Rd (~50m)	71	Yes	Yes	<ul style="list-style-type: none"> ○ solid site hoarding acting as construction noise barrier ○ layout of yard to move noisy processes as far from residences as practicable ○ full enclosure of concrete batch plant
Hendon Reserve Crushing Area	Crusher	6 months to 1 year	Hendon Ave (~100m) Methuen Rd (~100m)	77	Yes	N/A	<ul style="list-style-type: none"> ○ full enclosure of crushing plant
Topsoil removal/site preparation	Excavators/face shovel	~1 month	Varies along route. Typically 30 - 60 m	73	Yes	N/A	<ul style="list-style-type: none"> ○ temporary construction noise barriers
Road Construction and surfacing	Batch plant Concrete vibrator	~12 months	Varies along route. Typically 30 - 60 m	75	Yes	N/A	<ul style="list-style-type: none"> ○ temporary construction noise barriers

ANNEXURE B: ADDITIONAL SECTIONS TO BE INCLUDED IN THE CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN (CNVMP)

11.13 Noise Mitigation Option Determination – Hierarchy of Mitigation Options

In the event that potential non-compliance with the construction noise criteria of Section 2 of this Plan have been determined, appropriate mitigation options will be determined following the hierarchy set out below. Each question shall be considered in sequence before moving onto the next option.

1. Is it imperative that night-time works are undertaken, or can works be rescheduled to daytime?
2. Have equipment and methodologies been chosen that reduce the overall noise from the activity? Can quieter alternative equipment or methodologies be practicably implemented?
3. Can temporary construction noise barriers or screens be erected within the designation that provide effective acoustic shielding of the equipment/activity?
4. Can the works be sequenced to avoid sensitive times for neighbouring residents/businesses, e.g. can works be scheduled for school holidays?
5. Have affected persons be contacted and implications be discussed/feedback been taken into consideration in the planning of this activity?
6. When appropriate, have residents been offered temporary relocation to suitable alternative accommodation, and have they accepted the offer?
7. Is the activity of long duration and likely to impact on the same group of residents for an extended time? Can affected houses be upgraded to provide a suitable internal noise environment during this activity, e.g. by installing alternative ventilation/improved glazing? (Advice from a suitably qualified acoustic engineer required)

11.14 Site Specific construction noise management plans

For any construction activities that have the potential to breach the noise limits, as set out in Section 2, a noise assessment will be undertaken.

Where the modelled/predicted levels are greater than the noise limits in Section 2 by less than 10 dBA, all practicable measures will be implemented as per the CNVMP with an aim to achieve compliance with the construction noise criteria. Monitoring of these works will be undertaken to confirm that the actual noise levels are less than or equal to the predicted levels.

If the actual levels are higher than the limit plus 10 dBA, works shall cease and a Site Specific Construction Noise Management Plan (SSNMP) will be submitted to Auckland Council for certification.

Where the modelled/predicted levels are 10 dBA or more above the noise criteria in Section 2, a SSNMP will be submitted to Auckland Council for certification prior to works commencing.

Notwithstanding the requirement to submit a SSNMP, noise mitigation measures will continue to be implemented as per the CNVMP and reviewed/monitored to confirm compliance and effectiveness of the plan. This includes the overall aim to achieve compliance with the relevant project noise criteria.

The likelihood of exceedance shall be determined by utilising appropriate prediction tools, e.g. the calculation tools of NZTA, specifically the NZTA NZS 6803 Tool:

<http://acoustics.nzta.govt.nz/monitoring-prediction-assessment/construction-maintenance-noise>

The SSCNMP shall contain, to an appropriate detail:

- The activity and location proposed;
- Timing/duration;
- Equipment utilised;
- Predicted noise levels;
- Identified dwellings at which compliance cannot be achieved with conventional mitigation measures;
- Alternative management and mitigation measures proposed.

The SSNMP shall be submitted to the Council Noise Officer and Council Compliance Officer for review and certification at least 5 working days prior to the proposed works commencing. Certification or otherwise will be provided by the Council within 3 working days of receipt of the SSNMP. Works will not commence until certification is received from Auckland Council.

The above is not required for emergency works or similar circumstances where the potential non-compliance could not be foreseen.

**ANNEXURE C: SUMMARY PROCESS FOR CONSTRUCTION
ACTIVITIES AND NOISE ASSESSMENT/MITIGATION RESPONSE
(FLOWCHART)**

Summary Process for Construction Activities and Noise Assessment / Mitigation Response

