

Eastern Busway – EB2/EB3R

Construction Noise and Vibration Management Plan

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List of Abbreviations and Definitions

Abbreviation and Definitions	Description
AT	Auckland Transport
BPO	Best Practicable Option
CNVMP	Construction Noise and Vibration Management Plan
EB2	Eastern Busway 2 (Pakuranga Town Centre)
EB3R	Eastern Busway 3 Residential
EBA	Eastern Busway Alliance
km	Kilometre(s)
m	Metre(s)
m ²	Square Metre(s)
m ³	Cubic Metre(s)
AUP(OP)	Auckland Unitary Plan (Operative in part) 2016
RMA	Resource Management Act 1991

1 Introduction

Eastern Busway Alliance (EBA) has developed this Construction Noise and Vibration Management Plan (CNVMP) on behalf of Auckland Transport (AT) to support the following stages of the Eastern Busway Project:

- The application for a notice for requirement (NoR) and resource consents in relation to Eastern Busway 2 (EB2) – Pakuranga Town Centre, including the Reeves Road Flyover (RRF) and Pakuranga Bus Station
- The applications for resource consents in relation to Eastern Busway 3 – Residential (EB3 Residential) – Ti Rakau Drive from the South-Eastern Arterial (SEART) to Pakuranga Creek, including Edgewater and Gossamer Intermediate Bus Stations.

The combined EB2 and EB3 Residential work packages are hereon referred to as 'EB2/EB3R'.

1.1 Purpose and Scope

The purpose of this CNVMP is set out a framework to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration during construction of EB2/EB3R. It identifies the noise and vibration performance standards that must, where practicable, be complied with and details the management and control methodologies to be implemented to achieve compliance. Where compliance cannot be achieved, the CNVMP identifies BPO mitigation measures to be implemented on a site-specific basis. Importantly, the CNVMP framework sets out steps to engage with the community and stakeholders to share information on potential effects of noise and vibration associated with EB2/EB3R and gain feedback on appropriate management approaches.

This CNVMP may be updated throughout the course of EB2/EB3R to reflect changes to construction techniques or the physical environment. All material changes to the CNVMP will require recertification by Auckland Council

Any schedules produced for site specific noise and vibration management will also require certification. Further details on the certification process are set out in Section 1.5 of this CNVMP.

1.1.1 Construction Noise and Vibration Management Plan Objectives

The CNVMP has been developed in accordance with Annexure E2 of the New Zealand Standard NZS6803:1999 'Acoustics – Construction Noise' (NZS6803:1999).

The objectives of the CNVMP are as follows:

- Outline measures to reduce noise and vibration where practicable, considering construction sequencing, construction design, hours of operation, construction processes, use of machinery and equipment
- Outline noise and vibration standards for EB2/EB3R and identify the receivers where they apply
- Identify the management and mitigation options, including communication with affected residents/stakeholders, and identification of BPO

- Development of alternative strategies where full compliance with the noise limits set out in NZS6803:1999 cannot be achieved, including consultation with residents, commercial activities, community facilities and other occupiers to achieve the BPO
- Set out methods and frequency for monitoring and reporting on construction noise and vibration
- Set out methods for receiving and responding to complaints about construction noise or vibration.

1.2 Project Description

As noted in section 1, this CNVMP relates to stages EB2 and EB3R of the overarching Eastern Busway Project.

EB2 commences from the intersection of William Roberts Road and Pakuranga Road and traverses west to the Ti Rakau Drive / Pakuranga Highway/South-Eastern Arterial (SEART) intersection.

EB2 will improve safety by simplifying intersections and the provision of extra crossings to the town centre (including more regular crossing intervals). New cycle lanes and walking paths will make it possible to walk or cycle off-road, improving accessibility and safety around the town centre.

Key elements of EB2 include:

- Pakuranga Station - the key station for Pakuranga/Howick users of the busway leading to the Panmure Station and Botany
- Reeves Road Flyover - provides for local traffic to bypass the heavily congested Pakuranga Road and Ti Rakau Drive route to the SEART via an overpass between SEART and Pakuranga Road (north).

An overview of the proposed works is shown in Figure 1 below.

Figure 1 EB2 Overview



EB3R will provide the extension of the Rapid Transport Network from Ti Rakau Drive from the South-Eastern Arterial (SEART) to Pakuranga Creek in the east. The construction of the busway within EB3R will involve a staged approach to construction to minimise disruption on the existing road network.

Key elements of EB3R include:

- A separated busway through the centre of Ti Rakau Drive
- The construction of two new westbound lanes for general traffic
- Two intermediate bus stations, being Edgewater Station and Gossamer Station
- The western abutment for a future bridge across Pakuranga Creek, adjacent to the existing Ti Rakau Drive Bridge
- Intersection upgrades along Ti Rakau Drive, including William Roberts Road and Gossamer Drive.

The location of EB3R is shown in yellow in Figure 2 below.

Figure 2 EB3R Location (shown in yellow)



1.3 Roles and Responsibilities

The team responsible for achieving CNVMP objectives is set out in Table 1-1 below. A team approach shall be taken when planning and implementing CNVMP BPOs, management procedures and monitoring. Team members will have the appropriate experience, project involvement and responsibility to ensure that all relevant aspects of EB2/EB3R are considered when making decisions on CNVMP implementation. This will ensure adequate resources, commitment and expertise is applied to noise and vibration management throughout the construction period.

Table 1-1 Roles and Responsibilities

Name	Role	Phone number	Email
TBC	Project Director		
TBC	Environmental Lead		
Shivam Jakhu	Project Acoustics Advisor	021 549 584	shivam.jakhu@aecom.com

All personnel working on EB2/EB3R are responsible for the requirements of this CNVMP. They must be briefed on this CNVMP and sign an induction form and any noise and vibration schedules that relate to the work they will be carrying out.

1.4 Hours of Construction

The standard hours of operation during the construction period are:

- Weekdays – 07:00 to 18:00
- Saturdays – 07:00 to 15:00

1.5 No construction to occur at night time, on Sundays or public holidays expect under the circumstances set out in Section 3.6.3 of the Construction Environmental Management Plan (CEMP). Office hours for the site offices will be from 06:30 to 19:00. It should be noted that staff will begin arriving at site prior to construction start times and leave after construction end times. **Plan Review and Updates**

Once certified, minor amendments as a result of changes in design, construction materials, methods or management of effects can be made to the CNVMP without the need to seek recertification provided that the amendments are agreed to by Council, prior to the implementation of any changes.

The CNVMP may be submitted in parts or stages to address activities or to reflect the staged implementation of the Project. If submitted in part, the CNVMP will clearly show the linkage with plans for adjacent stages and interrelated activities.

Any amendments to the certified CNVMP that may result in a materially different outcome/effect will be submitted to Auckland Council to certify these amendments are consistent with the relevant designation and resource consent conditions prior to implementation.

If no written response is received from Council within 10 working days of the CNVMP being submitted for certification, the CNVMP will be deemed to have certification and works can commence.

2 Designation and Resource Consent Condition Requirements

This CNVMP has been prepared in accordance with the relevant designation and resource consent conditions contained in the condition set submitted with the application. If there is a conflict between the CNVMP and the corresponding legislative requirements, including consent conditions, then the legislative requirements shall prevail.

3 Performance Standards

3.1 Construction Noise

Construction noise will be measured and assessed in accordance with New Zealand Standard NZS6803:1999 “Acoustics – Construction Noise”. Construction noise will be managed to comply with the construction noise criteria (unless otherwise provided for in an approved Schedule). The construction noise criteria are provided in Table 3-1. These noise levels are applicable 1m from any building facade.

Table 3-1 Construction noise criteria

Receiver	Period	Upper Noise Level, dBA	
		Leq	Lmax
Buildings containing activities sensitive to noise	Monday to Friday 6:30am – 7:30am	55	75
	Monday to Saturday 7:30am – 6:00pm	70	85
	Monday to Friday 6:00pm – 8:00pm	65	80
	Sundays and public holidays 7:30am – 6:00pm	55	85
	At all other times	45	75
All other buildings	7:30am – 6:00pm	70	-
	6:00pm – 7:30am	75	-

3.2 Construction Vibration

Construction vibration will be measured and assessed in accordance with German Standard DIN 4150-3:1999 “Structural Vibration – Part 3 Effects of Vibration on Structures”. Construction vibration will be managed to comply with the construction vibration criteria (unless otherwise provided for in an approved Schedule). The construction vibration criteria are specified in Table 3-2.

Table 3-2 Vibration criteria

Vibration Level	Time	Category A	Category B
Occupied activities sensitive to noise	Night-time 2000h – 0700h	0.3mm/s ppv	2mm/s ppv
	Daytime 0700h – 2000h.	2mm/s ppv	5mm/s ppv
Other occupied buildings	All other times	2mm/s ppv	5mm/s ppv
All other buildings	Daytime 0630h – 2000h	Tables 1 and 3 of DIN4150-3:1999	

4 Equipment Noise and Vibration Source Data

4.1 Noise Sources

Various construction activities and pieces of equipment will act as noise sources on site. Table 4-1 details predicted noise levels from the likely significant noise sources at various receiver setback distances. The noise data has been taken from British Standard 5228-1:2009 “Code of practice for noise and vibration control on construction and open sites”, manufacturers data or the AECOM database of noise measurements¹. The noise levels do not account for mitigation.

The noise levels detailed in Table 4-1 allow identification of the need for mitigation or management to achieve compliance with EB2/EB3R noise criteria. Section 6 of this CNVMP provides details of management procedures and mitigation measures.

Table 4-1 Construction equipment source noise data

Equipment	Noise level at various set back distances, dB L _{Aeq}			
	5m	10m	20m	50m
Site establishment (including utility works, demolition and clearing)				
6-Wheeler trucks	85	79	73	65
10T Excavator with rock breaker attachment	94	88	82	74
Handheld concrete saw / chainsaw	93	87	81	73
10T Excavator	85	79	73	65
20T Excavator	85	79	73	65
500kg Plate compactor	88	82	76	68
Earthworks and civil works				
12T Steel compactor roller	85	79	73	65
6-Wheeler trucks	85	79	73	65
20T Excavator	85	79	73	65
Mobile crane	84	78	72	64
Pavement construction (including surfacing)				
6-Wheeler trucks	85	79	73	65
Plate compactor, 500 kg	88	82	76	68
Roller compactor, 12T	85	79	73	65
Roller compactor, 7T	85	79	73	65

¹ Past noise measurements of construction activities carried out and held on file by AECOM.

Handheld concrete saw / chainsaw	93	87	81	73
Bitumen sprayer	79	73	67	59
Grader	77	71	65	57
12T Double Drum Steel Roller	85	79	73	65
Concrete mixer truck	85	79	73	65
Bridge construction (Reeves Road Flyover)				
Gantry crane	73	67	61	53
Large crawler crane	81	75	69	61
Bored piling rig	89	83	77	69
20T Excavator	85	79	73	65
Concrete pump	81	75	69	61
Concrete mixer truck	85	79	73	65
6-Wheeler trucks	85	79	73	65

The noise levels in Table 4-1 will be reviewed once monitoring has been carried out and will be updated in accordance with Section 1.6 if there is a material change to the works methodology. The noise monitoring procedure is detailed in Section 8.2 of this CNVMP.

4.2 Vibration Sources

Some construction activities are predicted to generate elevated vibration levels during some construction activities. Table 4-2 summarises the setback distance from each of these activities, inside of which exceedance of either the DIN 4150 cosmetic building damage criteria or the Category A or B criteria detailed in Section 3 of this CNVMP may occur at the foundation of receiving buildings.

The vibration levels in Table 4-2 will be reviewed once monitoring has been carried out and will be updated if there is a material change to the works methodology. The vibration monitoring procedure is detailed in Section 8.3 of this CNVMP.

Table 4-2 Vibration emission radii

Equipment	Vibration emission radii			
	DIN 4150 Commercial structures	DIN 4150 Residential structures (Category B, daytime)	Amenity (Category A, daytime/Category B, night-time)	Amenity (Category A, night-time)
Roller Compactor 12T	2m	8m	21m	N/A
Roller Compactor 7T	1m	6m	12m	45m
20T Excavator	1m	5m	12m	N/A
Tipper Truck	1m	1m	2m	16m

Vibratory Plate Compactor	1m	1m	3m	21m
10T Excavator with rock-breaker attachment	1.8m	7.2m	18m	N/A

5 Affected Parties

5.1 Noise

Appendix A contains tables identifying buildings where construction activities have the potential to exceed the EB2/EB3R noise criteria, at EB2 and EB3R respectively. The maximum noise level predicted at each receiver during typical construction works is presented. Predictions have been carried out for daytime and night-time works. Predictions include 1.8m high noise barriers implemented effectively around construction sites where practicable.

5.2 Vibration – Building Damage (Category B) and Amenity (Category A)

Appendix B sets out tables where the Category A and B criteria are predicted to be exceeded at receivers along the EB2 and EB3R alignments. Predictions for daytime and night-time works are for the scenario where the 12T and 7T vibratory rollers are in use respectively at the boundary of the works footprint, and in operation at the closest location possible for each receiver.

Building condition surveys shall be carried out at every receiver where exceedance of the Category B criteria is predicted prior to the start of the works.

We note that the Category A criteria are only applicable to occupied buildings. The works will not affect amenity at buildings in proximity to the works if they take place while the building is unoccupied.

Additionally, Rule E.25.6.30(b) from the Auckland Unitary Plan sets out rules around vibration amenity. We consider these rules can be used as a guideline to address vibration amenity for the EB2 and EB3R works. The rule sets out similar vibration criteria as the Category A vibration criteria, however the rule allows for the amenity criteria to be exceeded if the works generating vibration take place for three days or less between the hours of 7am to 6pm, provided that a limit of 5mm/s PPV is complied with (same as the daytime Category B criteria), and:

- All occupied buildings within 50m of the extent of the works generating vibration are advised in writing no less than three days prior to the vibration-generating works commencing; and
- The written advice must include details of the location of the works, the duration of the works, a phone number for complaints and the name of the site manager.

5.3 Schedules

In accordance with the conditions submitted with the NoR and resource consent application a Schedule shall be prepared for any works where:

- a) Construction noise is either predicted or measured to exceed the noise standards in Table 3-1 **Error! Reference source not found.** or Table 3-2 **Error! Reference source not found.**, except where the exceedance of the L_{Aeq} criteria is no greater than 5 decibels and does not exceed:
 - i. 0630 – 2000: 2 periods of up to 2 consecutive weeks in any 2 months; or
 - ii. 2000 – 0630: 1 period of up to 2 consecutive nights in any 10 days;

- b) Construction vibration is either predicted or measured to exceed the Category B standard at the receivers in Table 3-2.

Schedules are required for receivers in Appendix A where a noise level above 75 dB L_{Aeq} is predicted for daytime works and where a noise level above 50 dB L_{Aeq} is predicted for night-time works, and/or receivers that are listed in Appendix B where an exceedance of the Category B criteria is predicted.

Schedules will be prepared during detailed design stage of EB2/EB3R for the activities where exceedances of the above are predicted. The Schedules cover affected receivers for the following site activities:

- Site Establishment
- Earthworks and Civil Works
- Pavement Works
- Reeves Road Flyover Construction
- Night-time works

The Schedules are provided in Appendix C.

The Schedules for these activities set out the:

- construction activity location, start and finish dates
- nearest neighbours to the construction activity
- predicted noise and/or vibration level for all receivers where the levels are predicted or measured to exceed the applicable standards
- proposed mitigation
- proposed communications with neighbours
- location, times, and types of monitoring.

6 Management Procedures and Mitigation Measures

The proposed works have the potential to exceed the relevant criteria at the closest receivers. To avoid/minimise exceedances it is vital that appropriate mitigation methods and measures are utilised. This management plan identifies the methods to achieve BPO for mitigating adverse effects during the construction works. These methods and measures will include, but not be limited to, those detailed in this section of the CNVMP.

6.1 Training

As a minimum before commencing work on site all personnel will receive training based on this CNVMP and how the CNVMP is relevant to their scope of works. If required, specific training will be provided for site personnel. Training will cover:

- Roles and responsibilities for managing noise and vibration
- Familiarisation with the noise and vibration criteria
- Details of noise and vibration sources on-site
- Noise and vibration mitigation and management procedures
- The location of sensitive receivers
- Construction noise and vibration effects on receivers
- Details of any operational requirements and constraints identified through communication and consultation
- The complaints management procedures.

6.2 Construction Vehicles, Traffic and Deliveries

Noise mitigation methods and measures for construction vehicles, traffic and deliveries shall include, where practicable:

- Fitting engine exhausts with silencers
- Using broadband reversing alarms
- Minimising slamming doors
- Minimising speed and engine revs
- Controlling / limiting noise from vehicle stereos being operated on site
- Minimising the use of horns
- Turning engines off when stationary for extended periods of time
- Placing bedding layer or resilient liner in truck trays
- Using rubber seals around tailgates
- Minimising track squeal from tracked equipment such as excavators, by maintaining tracks regularly.

6.3 Plant and Equipment

Plant and equipment noise and vibration mitigation methods and measures shall include, where practicable:

- Selecting plant and equipment with low noise and vibration emission levels
- Turning off plant and equipment or throttle them down to a minimum when not in use
- Selecting appropriately sized equipment for the task
- Electric motors should be used as a substitute for diesel engines where practicable
- Using mufflers and engine covers/screens where appropriate
- Ensuring equipment is operated in the correct manner and correctly maintained, including replacement of engine covers, repair of defective silencing equipment, tightening of rattling components, repair of leakages in compressed air lines and shutting down of equipment not in use
- Avoiding, where practicable, the use of equipment which generates impulsive noise, including:
 - dropping materials from a height
 - metal-to-metal contact on equipment.
- Minimising drop height of materials when transferring (e.g. loading and unloading vehicles and storage areas)
- Enclosing generators with an effective muffler
- Using power from the electricity network rather than from generators
- Reducing noise and vibration emissions from plant that has the potential to exceed the criteria by installing silencers, vibration isolation or other appropriate mitigation
- Placing tools and equipment on the ground, rather than dropping
- Covering surfaces with resilient material where tools / equipment are placed
- Not dragging equipment on the ground
- Minimising the need for striking bare metal with tools
- Where spoil is being loaded into a dump truck, or fill materials are being unloaded from a dump truck, position the truck to minimise tracking movements
- Managing noise generated from the use of concrete, including by limiting noise generated by aggregate loading or by hammering the mixing
- Using broadband reversing alarms on all mobile equipment
- Crane and secure loads using straps rather than chains when safe and practicable
- Locate plant and equipment away from sensitive areas, such as next to residential buildings, to maximise distance from affected parties. Where this is not possible, restricted hours of operation should be considered.

6.4 Pneumatic Breakers

Noise and vibration mitigation methods and measures for breaking activities shall include, where practicable:

- Selecting equipment for the job that takes into account the need to minimise the length of time taken to complete the operation and minimise noise generation
- Not “blank” firing the hammer. The activating valve should only be operated with the hammer in contact with the surface to be broken
- Keeping breaker bushes and shafts greased as necessary
- Using the correct chisel / tip shape for the type of material being broken
- Using acoustic screens which block line of sight between breaker and sensitive receivers where work is contained within a compact area.

6.5 Compaction

Noise and vibration mitigation methods and measures for compaction activities shall include, where practicable:

- Providing mufflers and engine covers/screens on plant where appropriate
- Removing obstructions on surfaces which may exacerbate vibration transmission where appropriate, prior to use of the compactor.

6.6 Generators

Noise mitigation methods and measures for generators shall include, where practicable:

- Installing enclosures around generators
- Using mufflers and engine covers/screens where appropriate
- Turn off generators or throttle them down to a minimum when not in use
- Maximise the distance between the engine exhausts of the generators and the nearest sensitive building façades.

6.7 Piling

Noise and vibration mitigation methods and measures for piling activities shall include, where practicable:

- Minimising cable slap and chain clink
- Providing mufflers and engine covers/screens on plant where appropriate
- Removing obstructions which may exacerbate vibration transmission where appropriate, prior to piling operations
- Minimise alternating rotation of the bored piling auger to loosen spoil into the muck bin. Shaking the ‘kelly bit’ connection creates a very loud banging that can result in noise complaints.

6.8 Noise Barriers and Enclosures

Noise barriers or enclosures will be used in areas where the noise criteria are predicted to be exceeded, and where they provide effective mitigation.

Noise barriers will generally only be effective for ground floor receivers where noise levels would be reduced by approximately 10 dBA. For a noise barrier to be effective it must physically obstruct line of sight between the noise source and receiver. Receivers on the first floor and above will be able to see over the noise barrier and it will provide little attenuation.

An effective noise barrier is constructed as follows:

- Positioned to physically obstruct line of sight between the construction work and receiver, where this is practicable
- Positioned as close as practicable to the noisy construction activity
- Abutted or overlapped to provide a continuous screen with no gaps at the base or between panels
- Be a minimum of 2m high.

Noise barriers may be constructed from plywood with a minimum surface mass of 10kg/m². Proprietary noise mats are available that have a lower surface mass but provide the same or better levels of noise attenuation. Noise mats shall be utilised during temporary works and works that progress quickly.

Noise enclosures should be utilised where practicable as they provide better attenuation to receivers above ground floor level.

Where enclosures are proposed their design will be agreed with the EB2/EB3R Acoustics Specialist.

6.9 Traffic Tyre Noise

Vehicle movements may cause temporary decks, steel plates and manholes to rock or move, giving rise to nuisance noises. Sharp changes in the level of the road surface may result in tyre noise. EBA will use the following methods to reduce noise from these sources so far as reasonably practicable, especially where the noise source will exist for long periods:

- Firmly fix traffic decks to the road or other structural elements to prevent motion
- Placing rubber beneath traffic decks and steel road plates where movement occurs
- Providing smooth transitions between changes in road surface level
- Ensuring manhole covers are fitted correctly.

6.10 Scheduling of Activities

Scheduling of construction activities can be a key tool for managing construction noise and vibration effects. The time of day and the duration of the construction activities will be adjusted after consultation, where possible, to avoid particularly sensitive times for affected receivers. Consideration will also be given to respite periods and avoidance of activity on certain days (if requested by affected neighbours), where practicable.

Night-time disturbance to residential receivers will be reduced by carrying out noisy activities during the daytime.

Sensitive hours for receivers that have been consulted are included in the Record of Communication in Appendix D.

6.11 Night-time Works

In addition to the mitigation and management measures set out in section 6.1 to 6.10, the following measures will be implemented during night-works:

- Complete the works in as timely a manner as possible, to avoid works going late into the night.
- Avoid, where practicable, the night-time use of equipment which generates impulsive noise, including:
 - Dropping materials from a height
 - Metal-to-metal contact on equipment

7 Communication

Good stakeholder communication practices are a key component for the management of noise and vibration disruption from construction activities. Prior to construction commencing, clear communication channels will be established between the EB2/EB3R team and those in the community potentially most affected by construction activities. It is important that information is provided in a transparent and consistent manner in relation to exposure, duration, mitigation and management measures. Further detail on stakeholder engagement is set out in the Communication and Consultation Plan (CCP).

7.1 Stakeholder Engagement

Meetings with local business owners have been held to better understand business operating hours, sensitivities, building condition, ventilation and acoustics. Relationships with the following businesses are ongoing:

- Dementia NZ
- Te Tuhi (including Barnardos Early Learning)
- Pakuranga Medical Centre (property owners, centre manager, Triton Hearing)
- Pakuranga Library
- Citizens Advice Bureau
- Pakuranga and Howick Budgeting Service.

Ongoing communication and consultation will be undertaken with notable noise and vibration receivers throughout the duration of construction occurring in the vicinity.

7.2 Consultation Methodology

When construction noise and vibration are anticipated to exceed the relevant criteria, engagement with key stakeholders, neighbouring residents, and businesses will become key in mitigating disruption. The following practices will be implemented:

- A contact person will always be available during works, and the EB2/EB3R contact details will be prominently displayed at the entrance to the site(s) so that they are clearly visible to the public
- Early identification of upcoming works and an analysis of the impact on surrounding stakeholders
- Notification letters, describing activity, duration and dates will be provided to all residences and businesses within 100-400 m of the construction area
- All occupied buildings within 50m of the extent of the works generating vibration will be advised in writing no less than three working days prior to vibration-generating works commencing, and the written advice will include details of the location of works, the duration of the works, a phone number for complaints and the name of the site manager
- Individual notification shall be provided, and meetings offered to all neighbours that are predicted to experience noise or vibration levels that exceed the criteria detailed in Section 3 of the CNVMP after the BPO mitigation as detailed in Section 6 has been

applied. Where it is impractical to avoid an exceedance, communication and consultation shall be undertaken with the receiver to identify methods and measures to mitigate the adverse effects of construction, including identifying why the selected management and mitigation measures and methods reflect the best practicable option

- Ongoing consultation will be carried out throughout the construction period, and all stakeholder interactions will be recorded within the Record of Communications set out in Appendix D
- The record will include details of when the communication/consultation took place, what the comments were from the sensitive receivers, and where the comments have been incorporated into this CNVMP.
- All concerns and complaints regarding construction noise and vibration will be dealt with in accordance with Section 7.3 of this CNVMP.

7.3 Feedback and Complaints Procedure

Feedback and complaints will be dealt with in a responsible manner to ensure a relationship of trust and reliability between the community and the EBA.

The EBA shall ensure that:

- The CCP sets out the relevant roles and responsibilities of the EBA Communications and Engagement Team. The team will manage all feedback and complaints that arise on EB2/EB3R.
- The community is notified of the EB2/EB3R contact details through which complaints can be made. This will include the website, works notifications, onsite signage, and project publications and newsletters.
- EBA staff shall be briefed on the complaints process and are prepared to receive complaints through phone, by email, in writing, or through face-to-face contact.

The process for managing complaints is set out in Table 7-1.

Table 7-1 Feedback and complaints management process

Stage	Description
1	All feedback and complaints are forwarded to the EBA Communications and Engagement Team.
2	The EBA Communications and Engagement Team acknowledges the complaint on day of receipt by phone, email or in writing. If the Communications Engagement Team is not available, the EBA Environmental Lead or another member of the EB2/EB3R team shall acknowledge the complaint. Major complaints such as building damage will be addressed as soon as is practicable. Formal acknowledgement shall be made within five working days of receipt.
3	The contact details and details of the complaint are entered into the Record of Consultations, or EB2/EB3R consultation software.

4	The EBA Communications and Engagement Team shall work closely with the EBA Project Manager or Construction Manager to resolve complaints. They will be proactive in keeping complainants informed of what action is being taken to address their concerns.
5	If a complaint cannot be resolved within the complaints process timeframe (two working days), the complainant is invited to a meeting with the EBA Communications and Engagement Manager and the EBA Project Manager (or their delegated nominees). Resolution timeframes should be agreed at this meeting.
6	Each month a record of complaints activity will be reviewed by the EBA Community Manager to check that all actions have been closed out.

8 Monitoring

Monitoring will be undertaken to ensure works remain within the limits set out in the CNVMP and the site specific Construction Noise and / or Vibration Management Plans.

8.1 Overview

8.1.1 Attended Monitoring

For attended monitoring, a suitably qualified acoustic engineer will visit the site and measure noise and/or vibration levels in real time. This enables:

- Review of the implementation of this CNVMP, including the mitigation and management measures (Section 6) and engagement (Section 7 and Record of Communication set out in Appendix D)
- Verification of the predicted levels (Section 5) to check they are representative, and the response protocols are appropriate for the resulting effects
- Determination of compliance (Section 2).

8.1.2 Unattended Monitoring

For unattended monitoring, noise and/or vibration monitors are installed in suitable locations to measure levels continuously. They are set up to send an 'alert' message to the Environmental Lead and other relevant site personnel (Section 1.3) when levels exceed a pre-set alert threshold. The alert threshold(s) will be the relevant performance standard and/or site-specific threshold(s) determined through engagement (Appendix D).

Alerts will be investigated by the Environmental Lead as soon as practicable after they are received. The Environmental Lead will:

- Review site activities at the time of the alert and the setback distances for any relevant noise and/or vibration activities listed in Section 4
- Seek support from the Acoustics Advisor to undertake detailed analysis of the alert measurement data if there is residual uncertainty around whether the alert is project related. The Project Acoustic Advisor will review the time trace and any alert recordings to understand the magnitude, frequency and character of the event
- Review the BPO general measures (Section 6), relevant site-specific measures and attended monitoring to determine compliance if project related.

8.2 Noise

Construction noise will be measured and assessed in accordance with the requirements of New Zealand Standard NZS 6803: 1999 "Acoustics - Construction Noise"

Attended noise monitoring will be conducted by the Acoustic Specialist or trained noise monitoring staff as identified in Table 1-1 of this CNVMP.

All equipment that is predicted to exceed 70 dB L_{Aeq} at 5m will be measured, where practicable, when first operating on site.

Construction monitoring shall be undertaken during construction activities when noise has potential to exceed the criteria, or in response to reasonable noise complaints. Noise monitoring shall also be undertaken if the construction methodology changes, such that noise criteria may be exceeded at other locations.

Noise monitoring will be carried out at positions representative of noise sensitive locations at appropriate periods to check ongoing compliance with the construction noise criteria. The monitoring position will be at ground floor level.

Noise will be measured 1m from the most affected façade of the building, or in the area which relates to a noise complaint. If it is not practicable to measure at this position, measurements will be taken at a representative location and adjusted for distance and façade reflections if necessary. Measurements will also be taken at a known distance, such as 5m, from the noise generating equipment to establish source noise levels.

Additional measurement positions may be necessary if the initial measurement results indicate that noise may exceed criteria at other areas of the building façade. These measurements will be undertaken 1m from the façade if windows are normally open or inside the building if windows are normally closed. Where internal measurements are required, it will be necessary to control noise from local sources, such as people using the telephone, to ensure only construction noise is measured.

Noise monitoring will be conducted for 10-15 minutes at each measurement position, during representative construction activity.

The noise level will be reported with the measurement duration (e.g. 65 dB $L_{Aeq(15min)}$).

The noise monitoring procedure is outlined in Figure 3.

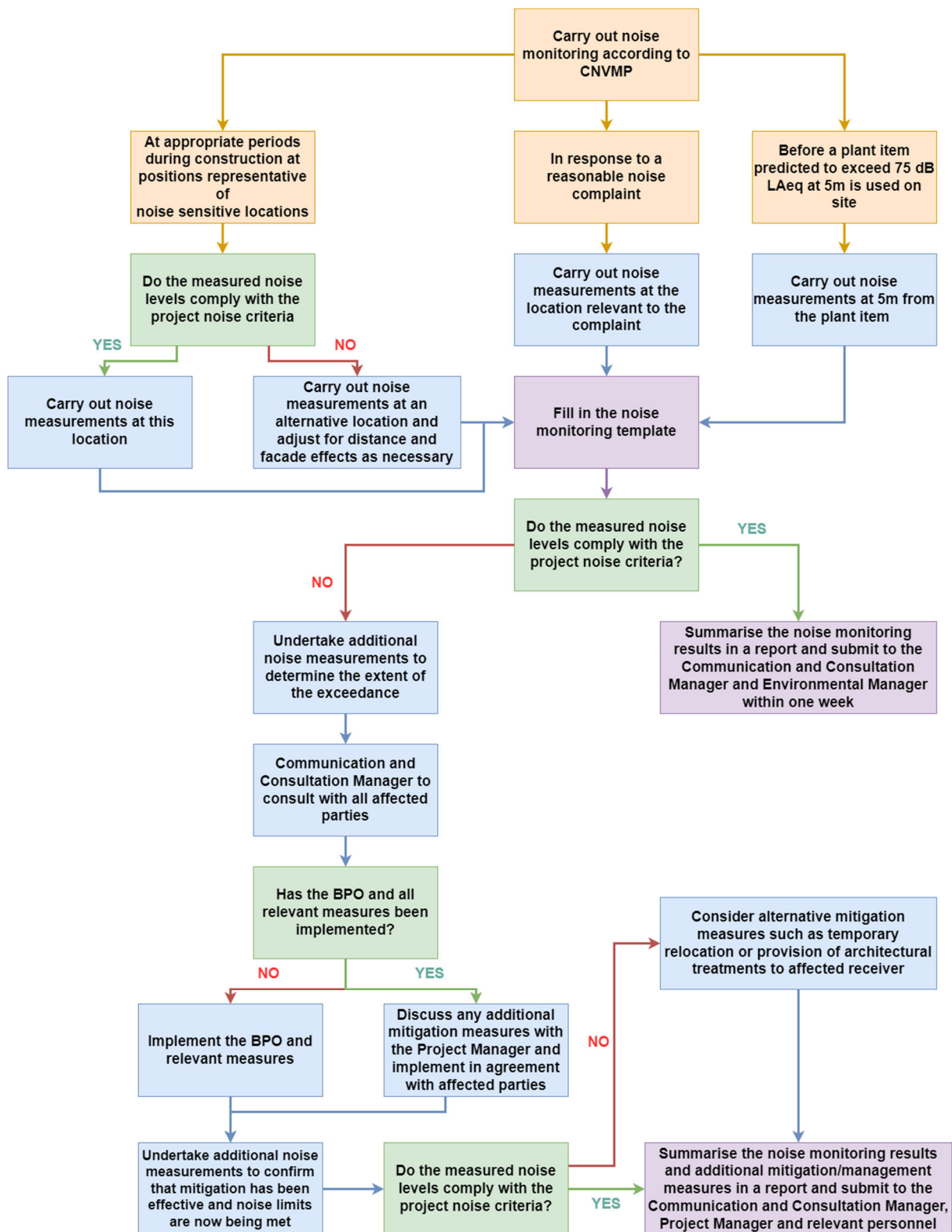


Figure 3 Noise monitoring procedure

8.3 Vibration

Construction vibration levels will be measured and assessed in accordance with the requirements of German Standard DIN 4150-3:1999 “Structural vibration – Part 3: Effects of vibration on structures”.

Vibration monitoring shall be undertaken:

- During the first use of the vibratory rollers, rock breaker and excavator, to verify measured vibration levels against the predicted levels set out in Table 4-2 (Section 4.2); and
- In response to reasonable complaints.

Attended vibration monitoring shall only be undertaken by the Project Acoustic Advisor or trained vibration monitoring staff as identified in Table 1-1 in Section 1.3 of this CNVMP.

Vibration shall initially be measured at the closest building foundations (usually at basement or ground floor level), and this requires consent to access the building of interest. Additional measurement positions may be necessary if the initial measurement results indicate that vibration may exceed criteria within other areas of the building. It may also be necessary to measure vibration levels in the habitable areas of buildings in response to a complaint.

Vibration monitoring will be conducted during representative construction activities and comprise measurements of peak particle velocity (PPV) at one-second intervals.

The duration of the vibration measurements will be sufficient to capture the highest vibration level from the source.

The vibration monitoring equipment (geophones) will be fixed to building structural members (e.g. with clamps, cable ties, or weighed down with sandbags).

The geophones will ideally be located at or near the façade of the building facing the vibration source and will be located away from areas where extraneous vibration (e.g. from footfall or building services) could affect the results.

Vibration monitoring shall also be undertaken in response to reasonable vibration complaints, or if the construction methodology changes such that vibration criteria may be exceeded at other locations.

The vibration monitoring procedure is outlined in Figure 4.

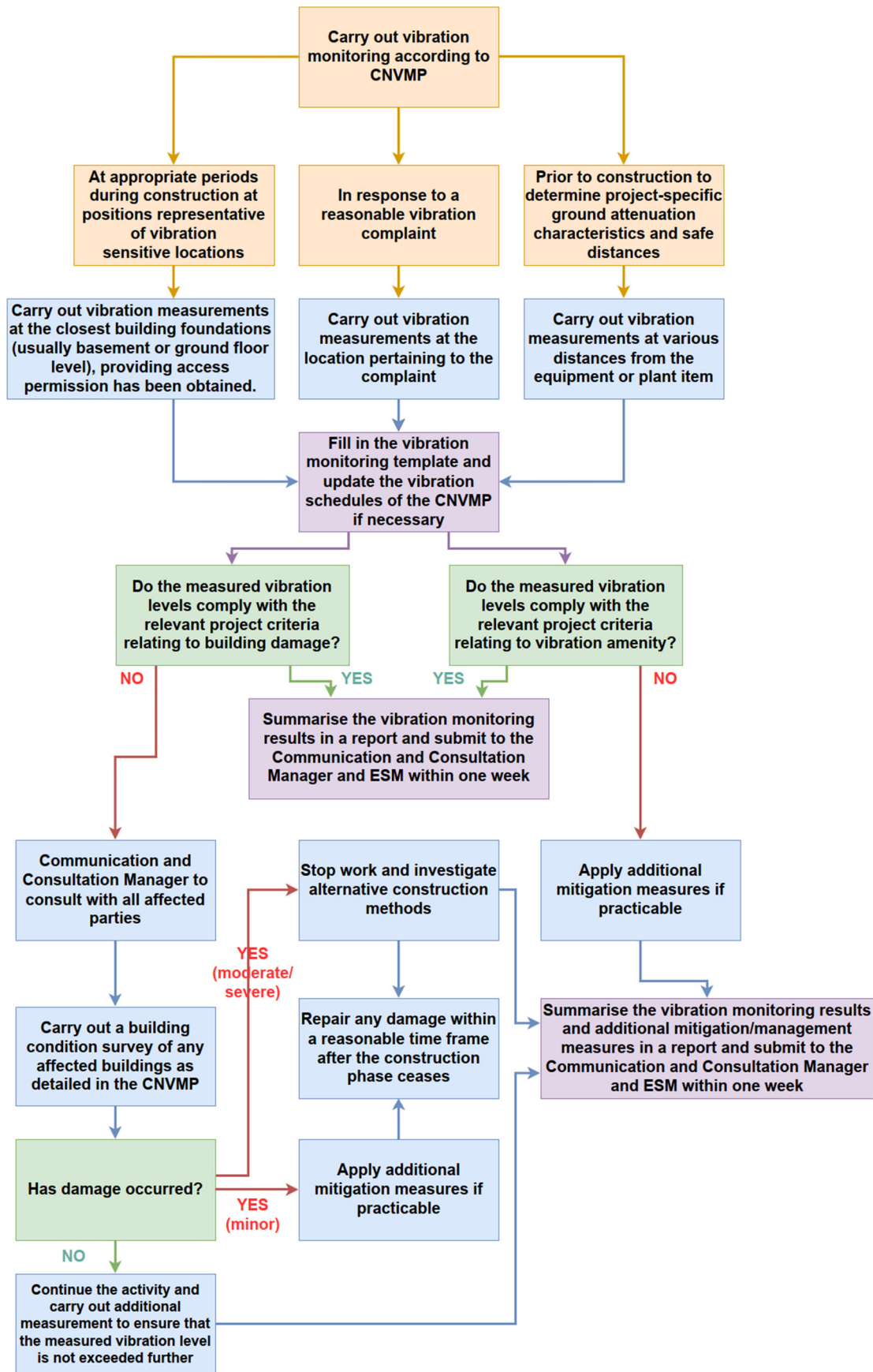


Figure 4 Vibration monitoring procedure

8.4 Reporting

All noise and vibration monitoring shall be summarised in a report and submitted to the EBA Communication and Stakeholder Manager and the Environmental Manager within one week of the assessment. The reports shall be stored electronically and kept at the site office, and made available to Auckland Council upon request.

The noise monitoring template is presented in Appendix E.

The vibration monitoring template is presented in Appendix F.

Appendix A – Affected Parties – Noise

Daytime works

Table 8-1 Affected parties during use of the piling rig, RRF construction, daytime

Address	Receiver type	Maximum predicted noise level, dB L _{Aeq}
5 Reeves Road	Commercial	86-90
2r Ti Rakau Drive	Commercial	
11 Reeves Road	Commercial	76-80
13r Reeves Road	Commercial	
26 Ti Rakau Drive	Commercial	
3 Reeves Road	Commercial	71-75
2 Cortina Place	Commercial	

Table 8-2 Affected parties during use of the excavator, EB2

Address	Receiver type	Maximum predicted noise level, dB L _{Aeq}
141 Pakuranga Road	Commercial	86-90
2r Ti Rakau Drive	Commercial	
11 Cortina Place	Commercial	
11 Reeves Road	Commercial	
5 Reeves Road	Commercial	
23b Dale Crescent	Residential	
1-2/17 Ti Rakau Drive	Residential	
10 7 Aylesbury Street	Commercial	
1/15,15 Ti Rakau Drive	Residential	
1/9 Cortina Place	Commercial	
7a Cortina Place	Commercial	
10 Aylesbury Street	Commercial	81-85
10-14 Cortina Place	Commercial	
1-2/5 Ti Rakau Drive	Residential	
1-2/13 Ti Rakau Drive	Residential	76-80 71-75
1-2/92 Pakuranga Road	Residential	
126 Pakuranga Road	Commercial	
120 Pakuranga Road	Commercial	
100 Pakuranga Road	Residential	
3 Reeves Road	Commercial	
21 Dale Crescent	Residential	
3 Ti Rakau Drive	Residential	
1-2/7 Ti Rakau Drive	Residential	
94 Pakuranga Road	Residential	
116b Pakuranga Road	Residential	
2/23 Ti Rakau Drive	Residential	

13r Reeves Road	Commercial
1/11,11 Ti Rakau Drive	Residential
12,12a William Roberts Road	Residential
18a William Roberts Road	Residential
1/9,9 Ti Rakau Drive	Residential
106 Pakuranga Road	Residential
1-2/90 Pakuranga Road	Residential
1/14 William Roberts Road	Residential
24 William Roberts Road	Residential
1/19,19 Ti Rakau Drive	Residential
64 Dale Crescent	Residential
24r William Roberts Road	Residential
7 Cortina Place	Commercial
2 Dale Crescent	Residential
15 Reeves Road	Residential
100 Pakuranga Road	Residential
2 Cortina Place	Commercial
183 Pakuranga Road	Residential
21 Ti Rakau Drive	Residential

Table 8-3 Affected parties during use of the excavator, EB3R

Address	Receiver type	Maximum predicted noise level, dB L _{Aeq}
148 Edgewater Drive	Residential	86-90
165b Edgewater Drive	Residential	
176 Gossamer Drive	Residential	
6,1/6 Mattson Road	Residential	
4 Edgewater Drive	Residential	
9a,9b Mattson Road	Residential	
165a Edgewater Drive	Residential	81-85
212 Ti Rakau Drive	Residential	
5a Tiraumea Drive	Residential	76-80
75a Ti Rakau Drive	Residential	
1-2/2 Chevis Place	Residential	
1-2/130 Ti Rakau Drive	Residential	
128 Ti Rakau Drive	Residential	
158 Ti Rakau Drive	Residential	
214 Ti Rakau Drive	Residential	71-75
92 Ti Rakau Drive	Residential	
1-2/1 Chevis Place	Residential	
160 Ti Rakau Drive	Residential	

5 Tiraumea Drive	Residential
176 Ti Rakau Drive	Residential
156 Ti Rakau Drive	Residential
138 Ti Rakau Drive	Residential
172 Gossamer Drive	Residential
207 Ti Rakau Drive	Commercial
4 Tiraumea Drive	Residential
184 Ti Rakau Drive	Residential
94 Ti Rakau Drive	Residential
171 Gossamer Drive	Residential
126-2/126 Ti Rakau Drive	Residential
146 Edgewater Drive	Residential
169 Gossamer Drive	Residential
108 Ti Rakau Drive	Residential
136 Ti Rakau Drive	Residential
210 Ti Rakau Drive	Residential
2a, 2b, 2c Marriott Road	Residential
174 Ti Rakau Drive	Residential
102 Ti Rakau Drive	Residential
106 Ti Rakau Drive	Residential
100 Ti Rakau Drive	Residential
140 Ti Rakau Drive	Residential
186 Ti Rakau Drive	Residential
166 Ti Rakau Drive	Residential
170 Ti Rakau Drive	Residential
1/9 Bolina Crescent	Residential
90 Ti Rakau Drive	Residential

Night-time works

Table 8-4 Predicted noise levels during use of the chainsaw during tree removals (night-time), EB2

Address	Maximum predicted noise level, dB L_{Aeq}	Address	Maximum predicted noise level, dB L_{Aeq}
1-2/5 Ti Rakau Drive	71-75	8 Undine Street	46-50
3 Ti Rakau Drive	66-70	8 Palm Avenue	
1-2/7 Ti Rakau Drive		2/23 Ti Rakau Drive	
1/9,9 Ti Rakau Drive		55 Dale Crescent	
21 Dale Crescent	61-65	1-2/101 Pakuranga Road	
23b Dale Crescent		7 Undine Street	
1-2/90 Pakuranga Road		13 Osprey Street	
1/11,11 Ti Rakau Drive		1-2/24 Dale Crescent	

1-2/92 Pakuranga Road	56-60	1 Tamaki Bay Drive	40-45
25 Dale Crescent		1-2/30 Dale Crescent	
23a Dale Crescent		10 Anthony Place	
16 Dale Crescent		21 Ti Rakau Drive	
14 Dale Crescent		6 Undine Street	
12 Dale Crescent		95 Pakuranga Road	
1-2/13 Ti Rakau Drive		25 Pandora Place	
33 Dale Crescent		2/39 Dale Crescent	
105 Pakuranga Road		6 Anthony Place	
10a Dale Crescent		5 Undine Street	
94 Pakuranga Road		62 Dale Crescent	
27 Dale Crescent		1 Dowling Place	
1-2/11 Dowling Place		60 Dale Crescent	
13 Dowling Place		29 Tiraumea Drive	
1-2/15 Dowling Place		16 Dowling Place	
1/15,15 Ti Rakau Drive		1/19,19 Ti Rakau Drive	
1-2/18 Dale Crescent		1-2/32 Dale Crescent	
15 Undine Street	45 Dale Crescent		
1-2/5 Dowling Place	10 Dowling Place		
8 Dale Crescent	1-2/17 Dowling Place		
14 Undine Street	4 Dowling Place		
9 Dowling Place	1/34 Dale Crescent		
7 Dowling Place	8 Anthony Place		
1-26/33 Dale Crescent	31 Tiraumea Drive		
6 Dale Crescent	1-2/20 Dowling Place		
9a Undine Street	22 Osprey Street		
1-2/3 Dowling Place	36 Dale Crescent		
15 Osprey Street	1-2/2b Dowling Place		
17 Osprey Street	1-2/3 Palm Avenue		
1/23 Ti Rakau Drive	40 Dale Crescent		
1-2/17 Ti Rakau Drive	4a - 4b Palm Avenue		
1-2/20 Dale Crescent	61 Dale Crescent		
2 Dale Crescent	8 Dowling Place		
22 Dale Crescent	97 Pakuranga Road		
1/20 Osprey Street	3 Undine Street		
24 Osprey Street	41 Dale Crescent		
47c Dale Crescent	16 Osprey Street		
9 Undine Street	40a Dale Crescent		
100 Pakuranga Road	65 Dale Crescent		
	51-55		

103 Pakuranga Road	
4 Dale Crescent	
12 Undine Street	
7a Undine Street	
10 Undine Street	
5 Tamaki Bay Drive	46-50

10 Dale Crescent	
1-2/43 Dale Crescent	
38 Dale Crescent	
12 Anthony Place	
2a Dowling Place	

Table 8-5 Predicted noise levels during use of the chainsaw for tree removals (night-time), EB3R

Address	Maximum predicted noise level, dB L _{Aeq}
176 Gossamer Drive	75-79
172 Gossamer Drive	
138 Ti Rakau Drive	
108 Ti Rakau Drive	66-70
106 Ti Rakau Drive	
114 Ti Rakau Drive	
112 Ti Rakau Drive	
116 Ti Rakau Drive	
140 Ti Rakau Drive	
120 Ti Rakau Drive	
110 Ti Rakau Drive	
169 Gossamer Drive	
118 Ti Rakau Drive	
122 Ti Rakau Drive	
136 Ti Rakau Drive	
171 Gossamer Drive	
104 Ti Rakau Drive	
144 Ti Rakau Drive	
175 Gossamer Drive	
146 Ti Rakau Drive	
167 Gossamer Drive	
173 Gossamer Drive	
148 Ti Rakau Drive	
102 Ti Rakau Drive	
1-2/2 Chevis Place	
40 Riverhills Avenue	
2a, 2b, 2c Marriott Road	
150 Ti Rakau Drive	
129 Ti Rakau Drive	

Address	Maximum predicted noise level, dB L _{Aeq}
89 Ti Rakau Drive	51-55
1-2/81 Cardiff Road	
1 Paradise Place	
6 Wheatley Avenue	
158 Ti Rakau Drive	
8 Roseburn Place	40-45
10 Chevis Place	
14 Snell Place	
3 Roseburn Place	
39 Miramar Place	
1-2/73 Cardiff Road	
75 Cardiff Road	
3/9 Bolina Crescent	
92 Ti Rakau Drive	
17 Fremantle Place	
4 Bolina Crescent	
9 Fremantle Place	
1-2/4 Marriott Road	
6 Ellesmere Crescent	
9 Wheatley Avenue	
71 Cardiff Road	
5 Wheatley Avenue	
5a Tiraumea Drive	
14 Tiraumea Drive	
8 Wheatley Avenue	
88 Cardiff Road	
35 Miramar Place	
38 Riverhills Avenue	
16 Ellesmere Crescent	

75a Ti Rakau Drive		92, 1/92 Cardiff Road	
4 Edgewater Drive		94 Cardiff Road	
83 Ti Rakau Drive		1-3/59 Cardiff Road	
152 Ti Rakau Drive		96 Cardiff Road	
8 Ellesmere Crescent		7 Paradise Place	
100 Ti Rakau Drive		148 Edgewater Drive	
14 Edgewater Drive		12 Tiraumea Drive	
1/7 Wheatley Avenue		166 Ti Rakau Drive	
3 Wheatley Avenue		7 Snell Place	
126-2/126 Ti Rakau Drive		8 Chevis Place	
1-2/6 Roseburn Place		4 Chevis Place	
83c Ti Rakau Drive		210 Ti Rakau Drive	
7 Bolina Crescent		1-2/82 Cardiff Road	
1-2/1 Chevis Place		77 Cardiff Road	
36 Riverhills Avenue		19 Fremantle Place	
2/79 Cardiff Road		1-2/9 Roseburn Place	
9 Snell Place		7 Ellesmere Crescent	
91 Ti Rakau Drive		13 Tiraumea Drive	
2/5 Bolina Crescent		3 Paradise Place	
114a Ti Rakau Drive		5 Fremantle Place	
10 Ellesmere Crescent		12 Fremantle Place	
83b Ti Rakau Drive		8 Paradise Place	
65 Cardiff Road		2 Ellesmere Crescent	
6 Chevis Place		13 Wheatley Avenue	
142 Ti Rakau Drive		14 Mattson Road	
154 Ti Rakau Drive		1/79 Cardiff Road	
98 Ti Rakau Drive		10 Edgewater Drive	
156 Ti Rakau Drive		22 Miramar Place	
7 Wheatley Avenue		7 Chevis Place	
6 Bolina Crescent		1/5 Bolina Crescent	
11 Snell Place		5 Ellesmere Crescent	
1/67 Cardiff Road		7 Roseburn Place	
1-2/8 Edgewater Drive		98 Cardiff Road	
87 Ti Rakau Drive		13 Roseburn Place	
1-2/63 Cardiff Road	56-60	9 Tiraumea Drive	
96 Ti Rakau Drive		12 Paradise Place	41-45
5 Snell Place		100 Cardiff Road	
1-2/130 Ti Rakau Drive		78 Cardiff Road	
83a Ti Rakau Drive	51-55	3 Chevis Place	

128 Ti Rakau Drive		12 Roseburn Place	
1/9 Bolina Crescent		1-2/14 Roseburn Place	
6, 1/6 Edgewater Drive		24 Ellesmere Crescent	
2/9 Bolina Crescent		20 Ellesmere Crescent	
94 Ti Rakau Drive		1-2/11 Chevis Place	
14 Ellesmere Crescent		4 Snell Place	
67 Cardiff Road		33 Miramar Place	
61 Cardiff Road		9 Ellesmere Crescent	
14 Chevis Place		15 Fremantle Place	
7 Fremantle Place		145 Ti Rakau Drive	
3 Bolina Crescent		3 Ellesmere Crescent	
13 Snell Place		7 Marriott Road	
2/4 Ellesmere Crescent		102 Cardiff Road	
3 Fremantle Place		2 Snell Place	
69a,69b Cardiff Road		11 Tiraumea Drive	
1-2/4 Roseburn Place		3 Dolphin Street	
12 Ellesmere Crescent		18 Chevis Place	
97 Ti Rakau Drive		1-3/12 Mattson Road	
2 Paradise Place		5 Chevis Place	
4 Wheatley Avenue		18a Ellesmere Crescent	
2/17 Tiraumea Drive		16 Tiraumea Drive	
1-2/10 Roseburn Place		214 Ti Rakau Drive	
15 Tiraumea Drive		1/4 Ellesmere Crescent	
6 Paradise Place		18 Tiraumea Drive	

Table 8-6 Predicted noise levels during use of the concrete saw for pavement works (night-time), EB2

Address	Maximum predicted noise level, dB L _{Aeq}	Address	Maximum predicted noise level, dB L _{Aeq}
1-2/5 Ti Rakau Drive	71-75	103 Pakuranga Road	51-55
1-2/13 Ti Rakau Drive		24r William Roberts Road	
3 Ti Rakau Drive		26 Dale Crescent	
1-2/17 Ti Rakau Drive		1 Anthony Place	
1/11,11 Ti Rakau Drive		10 Dowling Place	
1-2/7 Ti Rakau Drive	66-70	3 Tamaki Bay Drive	

1/15,15 Ti Rakau Drive		24 William Roberts Road	46-50
1/19,19 Ti Rakau Drive		100 Pakuranga Road	
2/23 Ti Rakau Drive		16 Dowling Place	
1/9,9 Ti Rakau Drive		5 Tamaki Bay Drive	
21 Ti Rakau Drive		1 Tamaki Bay Drive	
1/23 Ti Rakau Drive		86 Ti Rakau Drive	
1-2/90 Pakuranga Road	61-65	19 Dowling Place	
1-2/3 Palm Avenue		38 Dale Crescent	
4a - 4b Palm Avenue		1-2/30 Dale Crescent	
1-2/92 Pakuranga Road		1-2/20 Dowling Place	
47c Dale Crescent		93 Pakuranga Road	
5 Palm Avenue		1-2/32 Dale Crescent	
94 Pakuranga Road		1-2/17 Dowling Place	
13 Dowling Place		2/34 Dale Crescent	
33 Dale Crescent		1-2/101 Pakuranga Road	
105 Pakuranga Road		97 Pakuranga Road	
6 Palm Avenue	36 Dale Crescent	41-45	
1-2/43 Dale Crescent	4 Anthony Place		
1-2/11 Dowling Place	1/34 Dale Crescent		
1-2/15 Dowling Place	4 Dowling Place		
1-2/5 Dowling Place	95 Pakuranga Road		
9 Dowling Place	25 Dale Crescent		
8 Palm Avenue	22 Dale Crescent		
2/39 Dale Crescent	5 Anthony Place		
7 Dowling Place	1/14 Dowling Place		
55 Dale Crescent	7 Anthony Place		
1-26/33 Dale Crescent	23b Dale Crescent	51-55	
1-2/3 Dowling Place	40 Dale Crescent		
84 Ti Rakau Drive	1-2/9 Anthony Place		
45 Dale Crescent	1a Dowling Place		
1-2/24 Dale Crescent	59 Dale Crescent		
41 Dale Crescent	1-2/2b Dowling Place		
1 Dowling Place			

Table 8-7 Predicted noise levels during use of the concrete saw for pavement works (night-time), EB3R

Address	Maximum predicted noise level, dB L_{Aeq}	Address	Maximum predicted noise level, dB L_{Aeq}
5a Tiraumea Drive	61-65	10 Mattson Road	46-50
1/10 Dolphin Street		13 Mattson Road	

4 Tiraumea Drive		16 Dolphin Street	
5 Tiraumea Drive		94 Ti Rakau Drive	
2/10 Dolphin Street		2/5 Bolina Crescent	
1/9 Bolina Crescent		7b Mattson Road	
8 Dolphin Street		13 Dolphin Street	
14a Dolphin Street		15 Dolphin Street	
7 Tiraumea Drive		3 Dolphin Street	
6 Tiraumea Drive		5 Dolphin Street	
14 Dolphin Street		6 Bolina Crescent	
9a,9b Mattson Road		8 Mattson Road	
14b Dolphin Street	56-60	17 Dolphin Street	
2/9 Bolina Crescent		7h Mattson Road	
8 Tiraumea Drive		13 Tiraumea Drive	
12 Dolphin Street		11 Dolphin Street	
7a Mattson Road		7c Mattson Road	
9 Tiraumea Drive		15a Dolphin Street	
7 Bolina Crescent		1 Aurea Avenue	
10 Tiraumea Drive		11a Dolphin Street	
11 Tiraumea Drive		3 Bolina Crescent	
13a Tiraumea Drive		1/9 Dolphin Street	
9 Mattson Road		7 Dolphin Street	41-45
6,1/6 Mattson Road		2/6 Cindy Place	
6 Dolphin Street		4 Bolina Crescent	
4,4a Dolphin Street		1/6 Cindy Place	
90 Ti Rakau Drive	51-55	14 Mattson Road	
12 Tiraumea Drive		5 Aurea Avenue	
7g Mattson Road		8 Cindy Place	
3/9 Bolina Crescent		15 Tiraumea Drive	
92 Ti Rakau Drive		1-3/57 Cardiff Road	
1/5 Bolina Crescent		7 Cindy Place	
1-3/12 Mattson Road	46-50	88 Ti Rakau Drive	

Table 8-8 Predicted noise levels during use of the concrete truck for RRF works (night-time), EB2

Address	Maximum predicted noise level, dB L _{Aeq}	Address	Maximum predicted noise level, dB L _{Aeq}
18a William Roberts Road		1/15,15 Ti Rakau Drive	51-55
12,12a William Roberts Road		10 Tiraumea Drive	
1/14 William Roberts Road	66-70	6 William Roberts Road	

23b Dale Crescent		2/8 William Roberts Road	
1/9 Bolina Crescent		10 Anthony Place	
7 Bolina Crescent		8 Dale Crescent	
16 William Roberts Road		17 Osprey Street	
2/9 Bolina Crescent		15 Osprey Street	
25 Dale Crescent		1-2/3 Palm Avenue	
5a Tiraumea Drive		13 Osprey Street	
21 Dale Crescent		14 Tiraumea Drive	
20 William Roberts Road		26 Dale Crescent	
27 Dale Crescent		12 Tiraumea Drive	
3/9 Bolina Crescent		2/39 Dale Crescent	
18 William Roberts Road		10 Undine Street	
15 Reeves Road		8 Undine Street	
33 Dale Crescent		11 Ayr Road	
33 Dale Crescent		8 Anthony Place	
2/23 Ti Rakau Drive		8 Dolphin Street	
1/5 Bolina Crescent		6 Dale Crescent	
33 Dale Crescent		18 Tiraumea Drive	
33 Dale Crescent		23a Reeves Road	
2/5 Bolina Crescent		29 Tiraumea Drive	
1/23 Ti Rakau Drive		2/9 Ayr Road	
24 William Roberts Road		2 Ayr Road	
10,2/10 William Roberts Road		16 Tiraumea Drive	
17 Reeves Road	61-65	25 Reeves Road	
19 Reeves Road		1/4 William Roberts Road	
6 Bolina Crescent		31 Tiraumea Drive	
4 Bolina Crescent		1-2/13 Ti Rakau Drive	
33 Dale Crescent		4 Dale Crescent	
23a Dale Crescent		5 Palm Avenue	
24r William Roberts Road		5 Ayr Road	
7 Tiraumea Drive		24 Tiraumea Drive	
5 Tiraumea Drive		5 Undine Street	
21 Ti Rakau Drive		24 Osprey Street	
17a Reeves Road	56-60	8 Ayr Road	

12 Reeves Road		6 Undine Street	
1a Ayr Road		2 Dale Crescent	
2/14 William Roberts Road		4 Anthony Place	
1-2/18 Dale Crescent		8 Reeves Road	
1/19,19 Ti Rakau Drive		7 Undine Street	
3 Bolina Crescent		7 Ayr Road	
13a Tiraumea Drive		6 Reeves Road	
1-2/17 Ti Rakau Drive		14 Reeves Road	
15 Tiraumea Drive		15c Anthony Place	
9a Undine Street		10 Reeves Road	
1 Ayr Road		1/17 Tiraumea Drive	
1-26/33 Dale Crescent		1/12 Reeves Road	
9 Tiraumea Drive		7 Dolphin Street	
21 Reeves Road		3 Dolphin Street	
9 Undine Street		116b Pakuranga Road	
11 Tiraumea Drive		5 Dolphin Street	
4a Reeves Road		29 Reeves Road	
1-2/20 Dale Crescent		3 Undine Street	
33 Dale Crescent		4 Ayr Road	
1/2 Reeves Road		4,4a Dolphin Street	46-50
22 Dale Crescent		6 Anthony Place	
14 Dale Crescent		14a Reeves Road	
23 Reeves Road		1 Undine Street	
12b William Roberts Road		6 Ayr Road	
15 Undine Street		2/13 Ayr Road	
6 Palm Avenue		31 Reeves Road	
1/19 Reeves Road		10 Ayr Road	
12 Dale Crescent		3/183 Pakuranga Road	
4 Tiraumea Drive		12 Ayr Road	
16 Dale Crescent		6 Dolphin Street	
2/17 Tiraumea Drive		15 Anthony Place	
3 Ayr Road		12 Anthony Place	
7a Undine Street		4 Undine Street	
8 Palm Avenue		1/13 Ayr Road	
14 Undine Street		14 Ayr Road	
3/14 William Roberts Road	51-55	4 Reeves Road	

1-2/24 Dale Crescent	
6 Tiraumea Drive	
13 Tiraumea Drive	
10a Dale Crescent	
4a - 4b Palm Avenue	
1/8 William Roberts Road	
8 Tiraumea Drive	
12 Undine Street	

6a Ayr Road	41-45
1/9 Ayr Road	
10 Dale Crescent	
11 Osprey Street	
14 Anthony Place	
4c Bennett Road	
2c Bennett Road	
2/12 Reeves Road	

Appendix B – Affected Parties – Vibration

Appendix C - Schedules

Appendix D – Record of Communication

Address of Sensitive Receiver	Representatives	Date	Comments
11 Cortina Place – Pakuranga Medical Centre	Rochelle Gill (EBA), Shivam Jakhu (EBA), Dale Shepherd (Pakuranga Medical Centre)	03/02/2022	<ul style="list-style-type: none"> • Dale, Practice Manager is leaving to live in Perth (18 February) – Tanya will be her replacement and is contactable on practicemanager@pakmed.co.nz • Medical Centre hours - Mon, Wed, Fri: 8am - 6pm, Tues, Thurs: 8am - 7pm, Saturday: 8.30am - 12.30pm (same as pharmacy and laboratory) • All rooms have heap pumps and are double glazed, modern building/fitout • Ventilation in main office and nursing area • Note – Triton Hearing managed their own building fitout. • Both Eileen Stables and Richard Mercer have knowledge of the building and were with the medical centre when it was built • A couple of hundred building piles go down 8 metres • On the first floor – Medical Centre has 15 consultation rooms (along Ti Rakau Drive and along the new William Roberts Road), and a server room on the Ti Rakau Drive side of the building. • The medical centre business has new owners Tend Health (Tend Health Holdings Limited)
11 Cortina Place – Triton Hearing	Rochelle Gill (EBA), Shivam Jakhu (EBA), Tahmina Seddiqi (Triton Hearing)	26/01/2022	<ul style="list-style-type: none"> • Noise measurement taken in Triton Hearing testing room • Hearing testing rooms all have double door entry providing a quiet environment inside the room • Triton Hearing have no external windows in their testing room areas • Opening hours are Monday – Thursday 7.30am – 6pm and Friday 8.30am – 5pm, closed during the weekend • Follow up – Tahmina would like more certainty around construction timing (if/when they can expect disruption and for how long), and how close the construction will be to their building
27R William Roberts Road – Dementia NZ	Rochelle Gill (EBA), Shivam Jakhu (EBA), Lesley and Marcia (Dementia NZ)	03/02/2022	<ul style="list-style-type: none"> • Three staff use this building periodically • Some staff members visit patients at home or at other locations and only use this building as required • Building use is only Monday to Friday • The building is used for classes for Dementia Patients and meetings with patients spouses/families

			<ul style="list-style-type: none"> • No mechanical ventilation – ceiling fans only • Façade is weatherboard, relatively old/worn building. Wooden window frames without seals at the corner office room. Glazed sliding door for corner office room and main meeting room facing William Roberts Road. • Patients can be upset by noise and disruption to routine. Construction activities may trigger emotions, anger or cause a distraction for patients. • Construction programme when available so Dementia NZ staff can schedule when they use the building.
13 Reeves Road – Te Tuhi/Barnardos Early Learning Centre	Hiraani Himona (Te Tuhi), Shivam Jakhu (EBA), Rochelle Gill (EBA)	26/01/2022	<ul style="list-style-type: none"> • Consultation was for Te Tuhi but noise at the Barnardos Early Learning Centre (Barnardos) was briefly discussed. • There is an outdoor play area at Barnardos which may be exposed to noise from the works – recommended that they are provided advance notice of works to coordinate with outdoor play time. • The floor plan provided shows the sleeping area for Barnardos being set back inside the building so sleep disturbance is not considered to be an issue of concern.

Appendix E – Noise Monitoring Template

Date: __/__/20__		Operator:	
Equipment set used	Model:	Serial No. :	
Date of last calibration: __/__/20__			

MEASUREMENT DESCRIPTION

<input type="checkbox"/> Machinery / operational noise (Not at a receiver)	<input type="checkbox"/> Noise at a receiver location						
Construction location:	Receiver address:						
Distance to machinery / operation: (m)	Distance to receiver: (m)						
Describe noise sources (e.g. roller, piling, generator) and the location relative to the receiver:							
Describe any other unrelated noises (e.g. traffic noise) and the location relative to the receiver:							
Describe any reflecting surfaces (e.g. walls, buildings) and the location relative to the receiver:							
Describe any other factors such as barriers/terrain, or relative elevations of sources and receivers:							
<p>It is useful to attach an aerial photograph where possible. If this is done include the following details:</p> <table> <tr> <td><input type="checkbox"/> Location of site activity</td> <td><input type="checkbox"/> Measurement Locations</td> <td><input type="checkbox"/> Location of reflecting surfaces</td> </tr> <tr> <td><input type="checkbox"/> Relative heights</td> <td><input type="checkbox"/> Locations of unrelated sources</td> <td><input type="checkbox"/> Intervening barriers/terrain</td> </tr> </table> <p>It is also useful to include photographs or diagrams of the measurement location, the major sound sources, and any other details you believe may be useful.</p> <input type="checkbox"/> Additional documents attached		<input type="checkbox"/> Location of site activity	<input type="checkbox"/> Measurement Locations	<input type="checkbox"/> Location of reflecting surfaces	<input type="checkbox"/> Relative heights	<input type="checkbox"/> Locations of unrelated sources	<input type="checkbox"/> Intervening barriers/terrain
<input type="checkbox"/> Location of site activity	<input type="checkbox"/> Measurement Locations	<input type="checkbox"/> Location of reflecting surfaces					
<input type="checkbox"/> Relative heights	<input type="checkbox"/> Locations of unrelated sources	<input type="checkbox"/> Intervening barriers/terrain					

MEASUREMENT DETAILS

Location reference	Time	Measurement duration, t	L _{Aeq(t)}	L _{AFmax}	Adjustment for façade reflection	Equipment operating on site	Sounds heard at measurement location (note dominant and L _{AFmax} sounds)		Compliance achieved (y/n)
							Construction equipment	Other sources	
	____h <input type="checkbox"/> Constant noise <input type="checkbox"/> Cyclic noise	__:__ min:sec	__. __ dB	__. __ dB					
	____h <input type="checkbox"/> Constant noise <input type="checkbox"/> Cyclic noise	__:__ min:sec	__. __ dB	__. __ dB					
	____h <input type="checkbox"/> Constant noise <input type="checkbox"/> Cyclic noise	__:__ min:sec	__. __ dB	__. __ dB					
	____h <input type="checkbox"/> Constant noise <input type="checkbox"/> Cyclic noise	__:__ min:sec	__. __ dB	__. __ dB					

NOTES Please include any issues that were encountered during the measurements or other factors that may influence the validity of this measurement.

Appendix F – Vibration Monitoring Template

Date: __/__/20__		Operator:	
Equipment set used	Model:	Serial No. :	
Date of last calibration: __/__/20__			

MEASUREMENT DESCRIPTION

<input type="checkbox"/> Machinery / operational vibration (Not at a receiver)	<input type="checkbox"/> Vibration at a receiver location	
Construction location:	Receiver address:	
Distance to machinery / operation: (m)	Horizontal Distance to receiver: (m)	
	Floor Number:	
Describe vibration sources (e.g. roller, piling, concrete breaking) and the location relative to the receiver:		
Describe any other unrelated vibration (e.g. traffic, other construction, footfall, lifts) and the location relative to the receiver:		
Describe geometry of foundation (e.g. walls, buildings) and the location relative to the receiver:		
Describe the coupling method (geophone to structure)		
Describe approximate composition of ground between source and receiver (e.g. basalt, sandstone)		
Describe structural resonance observed, if any. For example swaying at higher floors – note the approximate frequency and magnitude.		
It is useful to attach an aerial photograph where possible. If this is done include the following details:		
<input type="checkbox"/> Location of site activity	<input type="checkbox"/> Measurement Locations	<input type="checkbox"/> Location of intervening geometry
<input type="checkbox"/> Relative heights	<input type="checkbox"/> Locations of unrelated sources	<input type="checkbox"/> Changes in composition of terrain
It is also useful to include photographs or diagrams of the measurement location including building plans where available, the major vibration sources, and any other details you believe may be useful. It is important to note whether the measurement was at the foundation, or in the plane of the highest floor.		
<input type="checkbox"/> Additional documents attached		

MEASUREMENT DETAILS

Location reference	Time	Measurement duration, t	PPV	Dominant axis of movement	Dominant frequency, Hz	Equipment operating on site	Vibrations observed at measurement location		Compliance achieved (y/n)
							Construction equipment	Other sources	
	____h <input type="checkbox"/> Continuous <input type="checkbox"/> Transient	__:__ min:sec	__. __ mms ⁻¹						
	____h <input type="checkbox"/> Continuous <input type="checkbox"/> Transient	__:__ min:sec	__. __ mms ⁻¹						
	____h <input type="checkbox"/> Continuous <input type="checkbox"/> Transient	__:__ min:sec	__. __ mms ⁻¹						
	____h <input type="checkbox"/> Continuous <input type="checkbox"/> Transient	__:__ min:sec	__. __ mms ⁻¹						

NOTES Please include any issues that were encountered during the measurements or other factors that may influence the validity of this measurement

