



ASSESSMENT OF CONSTRUCTION NOISE AND VIBRATION EFFECTS

NZ Transport Agency Waka Kotahi
Mill Road Stage 1

AUGUST 2026

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QUALITY REVIEW AND APPROVAL RECORD

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1 INTRODUCTION

Marshall Day Acoustics (**MDA**) has been engaged to prepare an Assessment of Construction Noise and Vibration Effects for Stage 1 of the Mill Road Project (**the Project**) which is described in the substantive application (**the Application**).

This assessment discusses the:

- Existing noise environment;
- Proposed changes to the designations;
- Effects of alteration of the designation from a construction noise and vibration perspective;
- Requirements of the designation conditions relating to construction noise and vibration, and proposed alterations to those conditions; and
- Information requirements for an Outline Plan waiver.

A glossary of technical terminology is included in **Appendix B**.

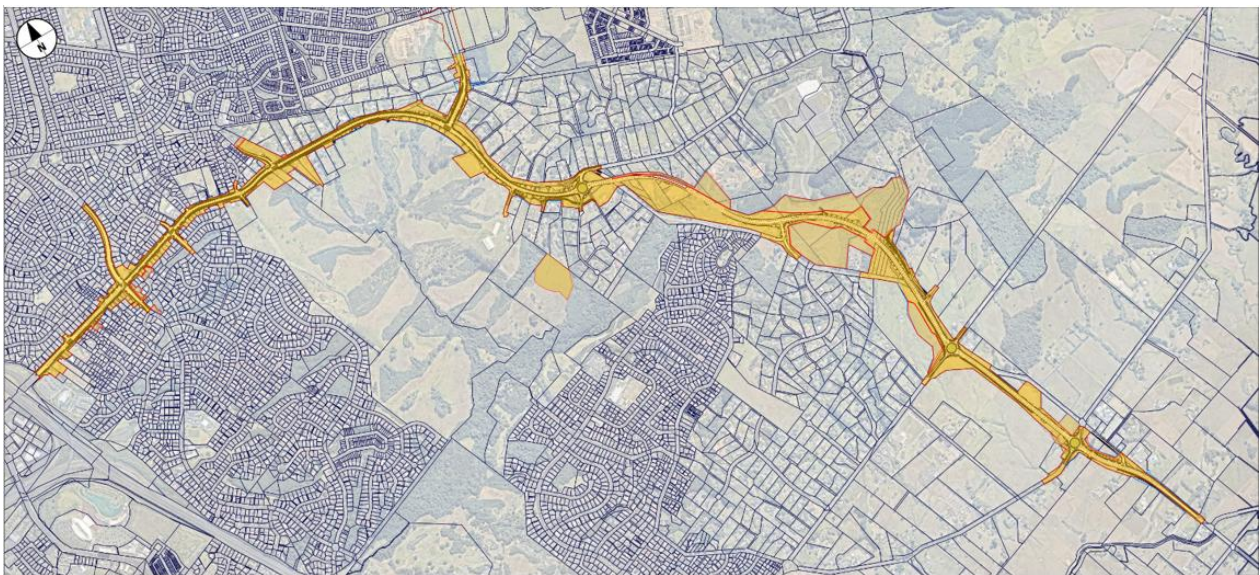


Figure 1: Extent of Mill Road Stage 1

2 EXISTING ENVIRONMENT

The Project incorporates three distinctly different existing environments that roughly coincide with the existing designations (Designation 6786):

- Designation 1: Urban from its western termination close to SH1 to Hilltop Road;
- Designation 2: Peri-urban from Hilltop Road to just north of Mill Road; and
- Designation 3: Rural from Mill Road to the Project's eastern termination between Alfriston and Phillip Roads.

The extent of the designations are shown in Figure 2 below.

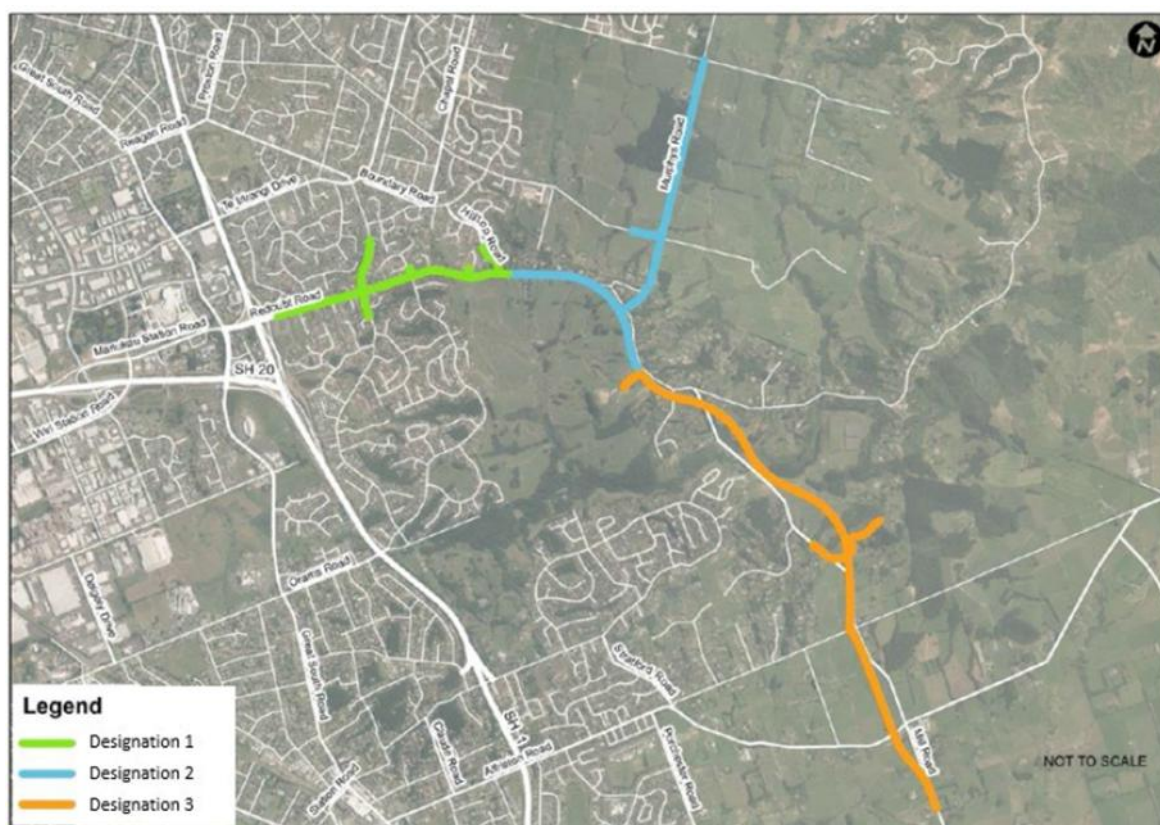


Figure 2: Original extents of Mill Road Designations (Designation 1, Designation 2 and Designation 3)

The noise environment in the vicinity of the Project has not materially changed from the assessment undertaken in 2014 (by up to 2 dB as discussed below) to support the designations. We have not undertaken ambient noise surveys during this stage of the Project as this Project relates to an alteration of an existing designation where the focus is on a change in authorised effects as opposed to comparison to existing noise levels.

Construction noise is not assessed in comparison with ambient noise levels, as construction activities are always significantly louder than ongoing noise such as from traffic.

3 OVERVIEW OF PROPOSAL: CONSTRUCTION NOISE & VIBRATION

The proposed Project generally follows the same alignment as per the designations. However, there have been some design changes that affect the construction noise and vibration generation to a varying degree. The design changes range from small adjustments of the designation boundary enabling low impact activities such as the establishment of stormwater treatment to significant changes such as new bridges. Each category of change is briefly discussed below.

3.1 Designation boundary adjustments

There are a number of small designation boundary adjustments proposed along the entire alignment:

- Inclusion of additional parts of sites that were already partially included in the designation, specifically 2/49 Redoubt Road and 2, 4 and 6 Everglade Drive.
- Other adjustments do not involve dwellings and are generally not in close proximity to any buildings, and we have not discussed them further.

We have based our assessment on the assumption that all buildings and structures that are inside the designation boundary will be removed, including those that would be included in the designation as a

result of the adjustments. This means that the dwellings behind those being removed will experience more noise from demolition of the buildings and less shielding from remaining construction noise. These effects will be managed through the Construction Noise and Vibration Management Plan (**CNVMP**) and, if required, Schedules to the CNVMP.

Overall, we consider that the amendments are not sufficiently significant to result in a materially different outcome compared with the effects authorised by the existing designations. The proposed management and mitigation measures required by the existing conditions and the proposed new conditions are appropriate to manage the noise effects.

3.2 Design changes proposed

There are two proposed significant amendment to the designated alignment:

- A new bridge is proposed to cross Mill Road just south of Redoubt Road. Instead of constructing an embankment and closing the existing Mill Road as per the existing designation, a bridge will allow the existing Mill Road to remain open for resident access. The construction of the bridge reduces the need for significant retaining walls and would result in a reduction in construction noise effects and may result in a positive overall effect compared with the existing designation. While a retaining wall will still be needed, it is much shorter and will take significantly shorter time to construct. It is likely that the bridge will need to be installed during night-time to avoid disruption to Mill Road before the new road is opened. This means that there may be additional noise effects (e.g. night-time noise may impact closest residents) that were not previously anticipated or authorised. These will need to be managed through the CNVMP and/or Schedules (refer Section 5).
- In addition, the bridge across Puhinui Gully has been realigned, moving the alignment towards the north. This means that the alignment will be significantly closer to dwellings at 361 and 375 Redoubt Road. The road will be in a cut adjacent to 375 Redoubt Road, necessitating a significant retaining wall. This retaining wall will be constructed using piling within 30 metres of 375 Redoubt Road. 375 Redoubt Road is a double storey dwelling, giving it uninterrupted line-of-sight to the construction site. This will result in additional noise effects, which will need to be managed through the CNVMP and/or Schedules.

Overall, this change to the designated alignment would not generally result in a material difference in construction noise or vibration effects and may in fact result in an improvement during daytime. Should night-time works be required, the noise and vibration effects from these will need to be appropriately managed and mitigated.

3.3 Adjustments resulting in a reduction in construction noise and vibration effects

The updated design includes a number of amendments that will likely have a positive effect on construction noise and vibration generation compared with the existing designation. These are:

- Several retaining walls along Redoubt Road, in the urban section of the Project (e.g. at 40 and 47 Redoubt Road and along Hollyford and Everglade Drives) are no longer required. The construction of retaining walls requires piling, generally smaller excavator mounted drills. Removal of these retaining walls from the plans will result in a reduction in noise effects.
- Removal of the Murphys Road/Redoubt Road connection north of the new Murphys Road intersection. This means that less construction will be required in the vicinity of 208 and 210 Redoubt Road, reducing both noise and vibration impacts.
- Redesign of the Redoubt Road/Mill Road intersection has allowed several retaining walls to be removed, e.g. in the vicinity of 323 Redoubt Road, reducing noise effects on this dwelling.
- The proposed upgrade of the Redoubt Road/Mill Road intersection to a roundabout means that fewer local roads will be constructed in the vicinity of Kinnard Lane, reducing construction noise effects on 5 Kinnard Lane and 337 and 345 Redoubt Road.

- A connection from the Project to the existing Mill Road in the vicinity of Harissa Place has been removed from the proposal. This will avoid construction close to, and reduce construction noise effects on, the new subdivision.
- At Alfriston School, the proposed changes to enable traffic rotation will reduce the need for road upgrades at the intersection of Alfriston Road and the existing Mill Road. This means that no construction immediately beside the school pool and outdoor play area will be required, avoiding both noise and vibration risks.

4 ASSESSMENT OF POTENTIAL CONSTRUCTION NOISE AND VIBRATION EFFECTS

The proposed project is subject to three designations with associated designation conditions for construction noise and vibration. The current designation conditions require that noise and vibration effects are assessed in relation to relevant criteria. Any infringements of the criteria will be managed through a CNVMP. When noise or vibration levels are predicted to be particularly high or where the receiving environment is sensitive (e.g. for night-time works), a Schedule to the CNVMP must be prepared that requires engagement with the affected parties.

The criteria and management framework of the existing designation will be retained, which means that there will be no changes to the already authorised effects. We discuss proposed alterations to the designation conditions in Section 5 below.

We have therefore assessed the construction noise and vibration effects from the proposed Project alignment where it results in a change in designation boundary. For these areas, there may be a change in effects from those already anticipated by the designations.

As noted in Section 3, there are a number of adjustments that are likely to result in a reduction in construction noise and/or vibration effects from those previously authorised. Small designation boundary adjustments may result in an increase in construction noise effects. The one proposed alignment change that is more significant is sufficiently distant from dwellings that effects would be similar to or less than those already authorised by the Designation.

4.1 Overall construction noise and vibration effects

The effects associated with the construction of the Project are authorised through the existing designations which contain designation conditions relating to construction noise and vibration. Construction noise and vibration was assessed prior to the designations being confirmed.

The magnitude and duration of effects will remain similar with the proposed Project to those considered by the designated road alignment. Main noise sources will be earthworks, the construction of retaining walls and road construction (e.g. milling, compaction and surfacing). Main vibration sources will be road compaction and the installation of retaining walls (with the assumption that retaining walls will be constructed using bored piles or using precast or block methodologies).

We have prepared a CNVMP that sets out the construction activities that will be undertaken, the predicted noise and vibration levels, mitigation and management of construction noise and vibration and how the residual effects may be experienced by neighbouring residents (see Appendix C17 of the substantive application).

The Project represents a standard road improvement project in an urban/suburban environment, with the provision of a new road in a peri-urban and rural environment. Such projects result in elevated noise and vibration levels during their construction. The effects will be limited in duration and frequency, as high noise or vibration works move along the alignment. Commonly used mitigation will be implemented (e.g. temporary barriers, choice of equipment and processes and timing of works). These measures are discussed in detail in the CNVMP.

We consider that the Project in its currently proposed form and location would result in noise and vibration levels and effects that are commonly anticipated for a significant infrastructure project, where compliance with the relevant criteria can generally be achieved except where works are close to dwellings.

The following four sections discuss the areas where changes to the Project may result in a change in effects. In any of these instances, the changes in effect are small and can be managed and mitigated to result in reasonable noise or vibration levels.

4.2 Designation boundary adjustments

This section only discusses areas where construction noise and vibration effects may be greater than was anticipated by the existing designations.

4.2.1 2/49 Redoubt Road (Designation 1)

The site at 2/49 Redoubt Road is proposed to be included in the designation.

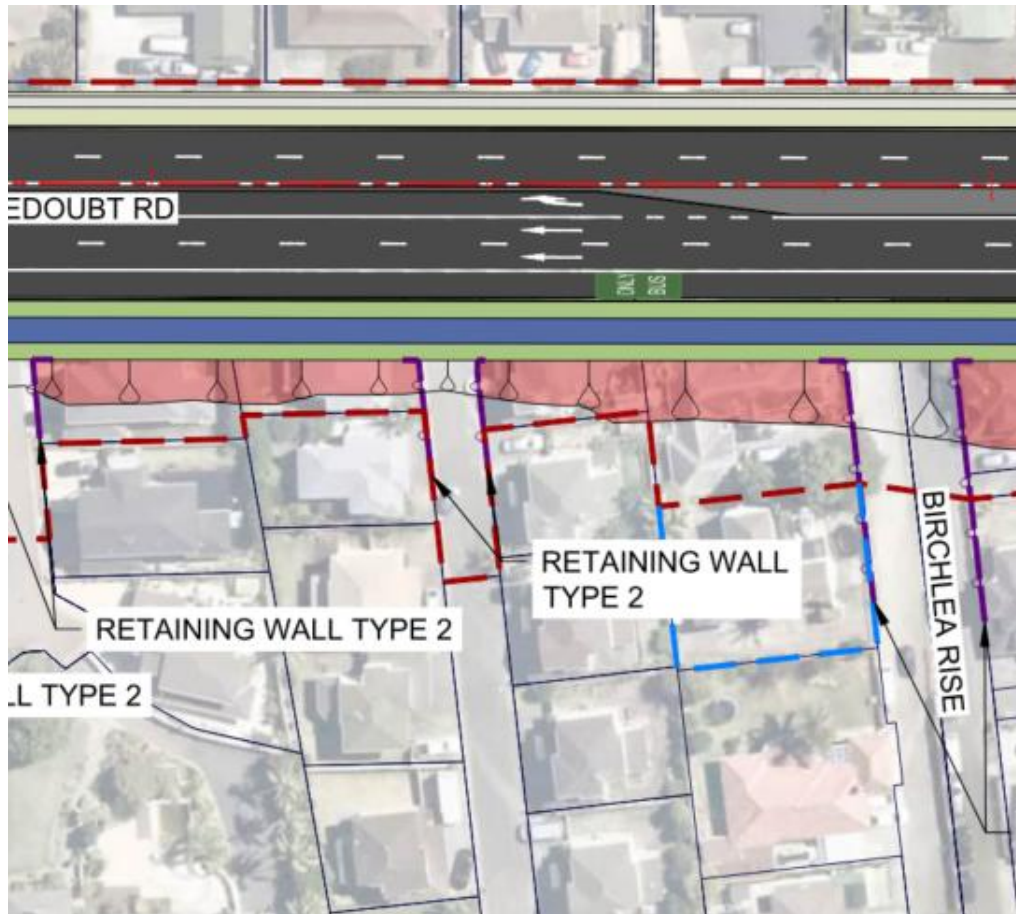


Figure 3: Designation changes – 2/49 Redoubt Road

This means that an additional dwelling would be removed, resulting in additional noise generation from the demolition of this building. In addition, the dwelling behind (49A Redoubt Road) will lose some shielding from the road construction due to the removal of the two dwellings.

Significant road works will remain at the same distance from the retained dwellings as per the designations, approximately 45 to 50 metres from the closest traffic lane. At that distance, works can be undertaken in compliance with the relevant noise and vibration criteria.

We predict that daytime noise criteria can be complied with at all times at the closest house affected by this designation change.

4.2.2 2, 4 and 6 Everglade Drive (Designation 1)

It is proposed to include the dwellings at 2, 4 and 6 Everglade Drive into the designation to enable the upgrade of the Redoubt Road/Everglade Drive intersection.

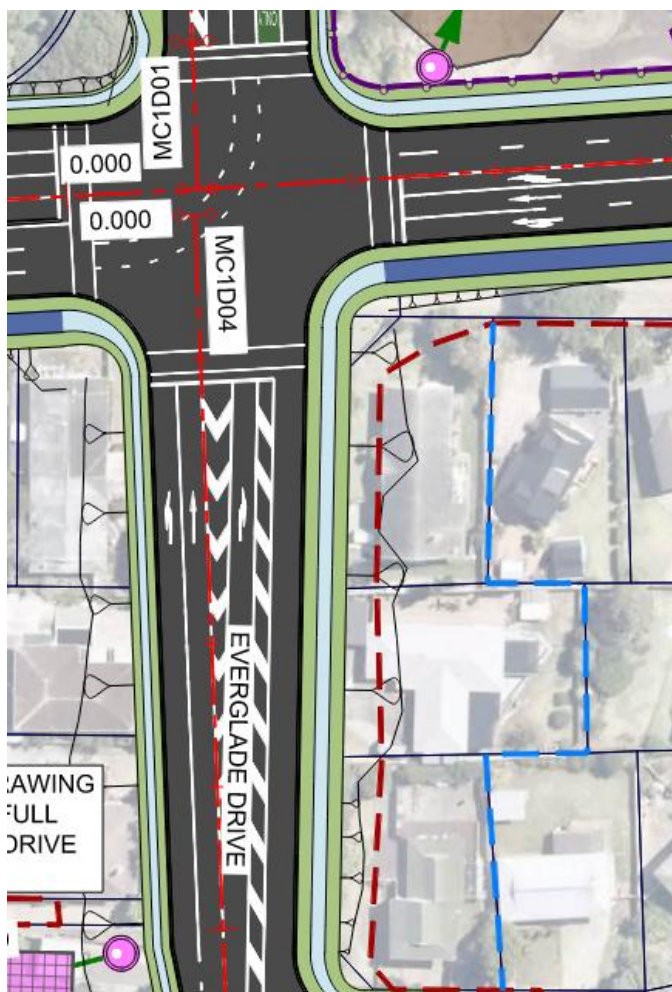


Figure 4: Designation changes – 2, 4 and 6 Everglade Drive

The removal of these dwellings will leave 81 Redoubt Road and 4 Flamingo Court more exposed to construction on Everglade Drive.

81 Redoubt Road and 4 Flamingo Court are predicted to receive noise levels marginally above the daytime noise limit, if no mitigation is implemented (e.g. barriers or choice of lower noise equipment). Had the intervening dwellings been retained, noise levels from works on Everglade Drive would have been about 10 decibels lower at 81 Redoubt Road and 4 Flamingo Court. However, with mitigation as that set out above, we predict that compliance with the daytime noise limit can be achieved.

4.3 Design changes proposed – Mill Road Bridge

As discussed in Section 3.2, the new bridge across Mill Road south of Redoubt Road (Designation 3) is a large change compared with the previously designated scheme, and therefore the 2014 assessment. Both are shown in Figure 5 and Figure 6 below. No change to the designation boundary is proposed west of Mill Road.

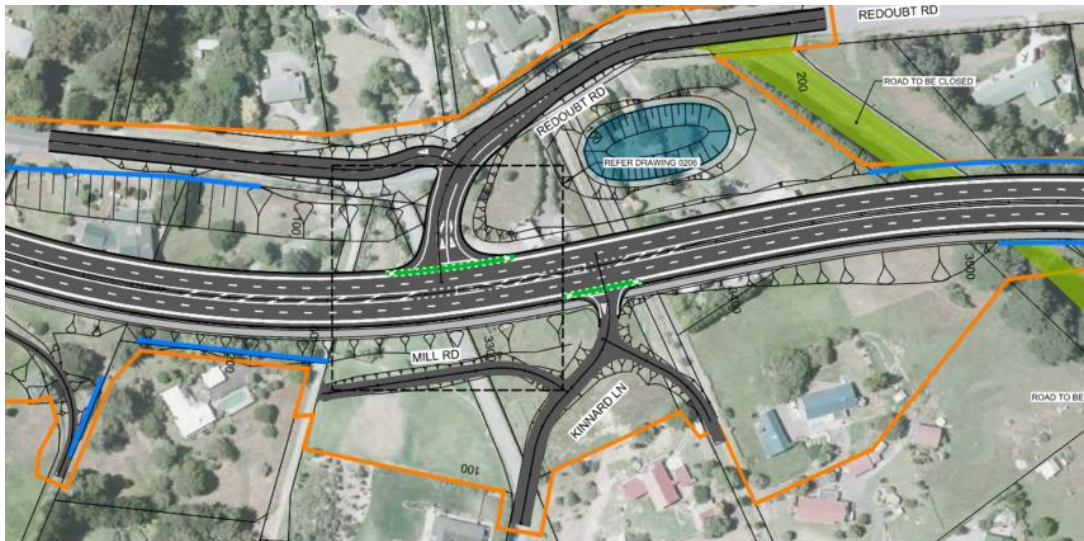


Figure 5: Consented alignment – Mill Road Intersection



Figure 6: Proposed alignment change – Mill Road roundabout and bridge

4.3.1 Daytime construction noise and vibration

Positive construction noise and vibration effects will be achieved by removing the retaining walls around 323 Redoubt Road. The retaining walls would be replaced with small embankments, avoiding piling and similar high noise and vibration activities close to the dwelling. This means that the predicted noise levels from construction would reduce from approximately 80 to 85 dB L_{Aeq} to 70 to 75 dB L_{Aeq} – a significant reduction.

The construction of the bridge will reduce the need for significant retaining walls on either side of the road. This will benefit 361 Redoubt Road, where no retaining wall would now be required, with noise level reductions of up to 10 dB.

The most affected dwelling by either scheme is 353 Redoubt Road. The dwelling is about 20m from the closest retaining wall for both the consented and proposed alignments. At that distance, there is the potential for daytime noise criteria to be infringed by a significant margin (up 7-9 dB). This is the same outcome that was already authorised through the existing designation, and effects will need to be managed through the CNVMP and/or Schedules.

4.3.2 Night-time construction noise and vibration

Should night-time works be required to install the bridge deck across Mill Road, this may result in different effects to those previously authorised through the existing designations. The original designation¹ requires

¹ Condition 27.3(b)

that any piling (e.g. for the construction of a bridge) can only be undertaken between 7am and 7pm. This may not be practicable if a road needs to be closed for the piling works, and some works may need to be undertaken during the night.

The bridge deck would be lifted into place by crane. Given the size of the designation area, any crane would likely be placed on the west of Mill Road. This places it at the greatest possible distance from the closest dwelling at 353 Redoubt Road. Closest dwellings from a likely crane position would be 341B Redoubt Road at about 95m and 353 Redoubt Road at about 60m.

At these distances, noise levels from crane use would be approximately 50 to 57 dB L_{Aeq} at closest dwellings. With such noise levels outside, internal noise levels would be 35 to 42 dB L_{Aeq} inside with windows open for ventilation, or 25 to 32 dB L_{Aeq} with windows closed if rooms face the construction site. Rooms facing away would receive 10 to 15 decibels lower noise levels.

Given that the construction of the bridge deck would likely take one to two nights only, we would expect that people can keep their windows closed for those nights. In that case, internal noise levels are appropriate for residential use and reasonable to avoid sleep disturbance.

Any noise and vibration effects from night-time works will be managed through a CNVMP and/or Schedules, including engagement with the affected residents.

4.4 Design changes proposed – Puhinui Gully bridge

An adjustment to the Puhinui Gully bridge has resulted in an expansion of the designation north in the vicinity of 361, 367, 371 and 375 Redoubt Road. The alignment would move closer to the dwellings and involve the construction of a retaining wall in the vicinity of 367 to 375 Redoubt Road. At its closest, the retaining wall piling will be approximately 20 metres from 361 Redoubt Road.

Both alignments are shown in Figure 7 and Figure 8 below. The designation boundary is proposed to move northeast south of Mill Road.



Figure 7: Consented alignment – Mill Road to Puhinui Gully

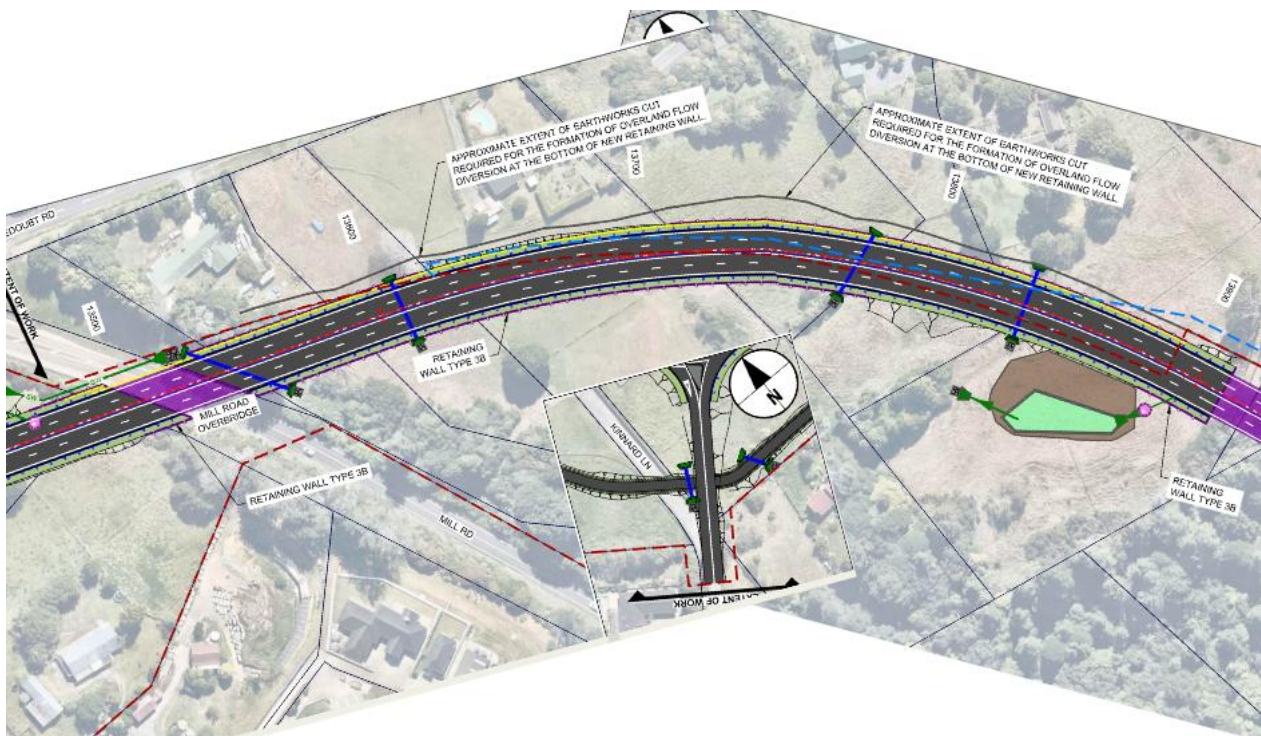


Figure 8: Proposed alignment change – Mill Road to Puhinui Gully

We anticipate that all works can be undertaken during daytime as the works are offline from any existing road.

Noise levels from piling would range from about 80 dB L_{Aeq} at 361 Redoubt Road to 75 dB L_{Aeq} at 375 Redoubt Road. Vibration levels would be well within the relevant amenity criteria at 20 metres distance, at less than 0.5 mm/s PPV.

Construction noise will need to be managed during piling. Possible mitigation options involve locating the piling rig away from the dwellings, facing south. This means that added distance and shielding from the machine itself will be achieved. Similarly, any excavation should be undertaken from south to north, maximising the distance from the equipment to the dwellings and shielding from the excavation face.

The works can be managed through the CNVMP and Schedules, and engagement with the residents will be important to ensure they are clearly informed about days and times of construction.

4.5 Night-time works in the road

Night-time works were always anticipated as part of the Project, as discussed in the 2014 assessment in Section 9.1, however, at the time, no details were set out. Works in the road are permitted by the Auckland Unitary Plan even if the relevant noise or vibration criteria are infringed, provided that compliance cannot practicably be achieved and a CNVMP is prepared.

Night-time works will likely be required for any service relocation or installation in active traffic lanes. This may include the construction of a stormwater pipe under Everglade Drive and some service relocation across Redoubt Road.

While we recommend that these works be minimised as far as practicable, and mitigation implemented, any such night-time works are likely to infringe the night-time noise criteria.

We recommend that mitigation be investigated such as the use of temporary barriers around any concrete cutting or breaking for service works.

We also understand that some vegetation clearance may need to be undertaken at night-time as it will require the closure of traffic lanes for safety reasons. In that case, the vegetation would be cut and stored on site to be removed or chipped during daytime to reduce noise effects on neighbouring sites.

Overall, we consider that any night-time works can be managed appropriately through the use of the CNVMP and Schedules.

4.6 Potential positive changes

As noted in Section 3.3, there are a number of changes to the designation or alignment that will likely result in a reduction in construction noise and vibration. While some are negligible, others have a more significant positive impact.

In particular, retaining walls will be reduced (i.e. either shorter or removed altogether) at:

- Redoubt Road in the urban area;
- Everglade Drive;
- Hollyford Drive; and
- In the vicinity of the new Redoubt Road/Mill Road roundabout.

Retaining walls that have been removed from the proposal, would be replaced with embankments, avoiding the need for piling and high noise and/or vibration works close to dwellings.

The proposed Project allows for some realignments of connecting roads and intersections which will reduce construction noise by 8 to 15 decibels at closest houses.

5 DESIGNATION CONDITIONS

The Project is authorised under three designations with identical associated conditions. The relevant conditions relating to construction noise and vibration are extensive, and not appropriate for some aspects of this Project for the reasons outlined below. The proposed conditions ensure that construction noise and vibration effects are managed in line with current best practice for roading projects. Therefore, the current conditions should be replaced with a simplified version that references the final CNVMP (see Appendix C17 of the substantive application) as the controlling document.

In order to ensure that all conditions are appropriately addressed, we provide Table 1 overleaf that sets out the original conditions and content, and the corresponding section of the CNVMP.

Where we have recommended amendments that are not in line with the current conditions, we have provided the reasoning and the amended content that is included in the CNVMP instead, as well as an assessment if the amendment will result in a change in outcome.

The amended designation conditions better reflect the current best practice approach to roading projects, using consistent, tested and reasonable methodologies to manage and mitigate construction noise and vibration effects. As a final CNVMP is provided with this report, the conditions should be replaced with the following essential conditions:

1. Construction Noise shall be measured and assessed in accordance NZS6803:1999 Acoustics – Construction Noise and shall comply with the noise standards set out in the following table as far as practicable, as far as is practicable:

	Time	dB LAeq(15min)	dB LAFmax
Occupied activity sensitive to noise			
Weekdays	0630-0730	55	75
	0730-1800	70	85
	1800-2000	65	80
	2000-0630	45	75
Saturdays	0630-0730	45	75

	0730-1800	70	85
	1800-2000	45	75
	2000-0630	45	75
Sundays and Public Holidays	0630-0730	45	75
	0730-1800	55	85
	1800-2000	45	75
	2000-0630	45	75
Other occupied buildings			
All days	0730-1800	70	N/A
	1800 - 0730	75	N/A

Where compliance with the noise standards set out above is not practicable, the methodology in Condition 4 shall apply.

- Construction vibration shall be measured in accordance with ISO 4866:2010 Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures and shall comply with the vibration standards set out in the following table as far as practicable:

Receiver	Details	Category A	Category B
Occupied Activities sensitive to noise	Night-time 2000h - 0630h	0.3mm/s ppv	1mm/s ppv
	Daytime 0630h - 2000h	1mm/s ppv	5mm/s ppv
Other occupied buildings	Daytime 0630h - 2000h	2mm/s ppv	5mm/s ppv
All other buildings	At all other times Vibration transient	5mm/s ppv	BS 5228-2* Table B2
	At all other times Vibration continuous	5mm/s ppv	BS 5228-2* 50% of Table B2 values

**BS 5228-2:2009 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration'*

Where compliance with the standards set out in the table is not practicable, the methodology in Condition 4 shall apply

- The Project shall be designed and constructed in accordance with the requirements of the Construction Noise and Vibration Management Plan (CNVMP) dated XXX. The CNVMP shall be implemented throughout the construction of the Project. The objective of the CNVMP is to develop and implement the Best Practicable Option for the management of construction noise and vibration effects.
- Where it is not practicable to achieve compliance with the construction noise and vibration standards, a Schedule to the CNVMP (Schedule) shall be prepared by a Suitably Qualified and Experienced Person in consultation with the owners and occupiers of sites subject to the Schedule. The objective of the Schedule is to set out the Best Practicable Option for the management of noise and/or vibration effects of the construction activity beyond those measures set out in the CNVMP. The Schedule shall include details such as:
 - Construction activity location, start and finish times;
 - The nearest neighbours to the construction activity;

- c) The predicted noise and/or vibration level for all receivers where the levels are predicted or measured to exceed the applicable standards and predicted duration of the exceedance;
- d) The proposed mitigation options that have been selected, and the options that have been discounted as being impracticable and the reasons why;
- e) The consultation undertaken with owners and occupiers of sites subject to the Schedule, and how consultation has and has not been taken into account; and
- f) Location, times and types of monitoring.

The Schedule shall be submitted to the Manager for information at least 5 working days, except in unforeseen circumstances, in advance of Construction Works that are covered by the scope of the Schedule and shall form part of the CNVMP.

Table 1 Designation conditions

Condition no.	Condition	Recommended amendment (if any)	Section of CNVMP where this is addressed																																											
24	24.1 Construction Noise shall, as far as is practicable, comply with NZS 6803:1999 Acoustics – Construction Noise, specifically the following criteria: a) Residential receivers <table> <tr> <th></th><th>Time</th><th>dB L_{Aeq(T)}</th><th>dB L_{Amax}</th></tr> <tr> <td rowspan="4">Weekdays</td><td>0630-0730</td><td>55</td><td>75</td></tr> <tr> <td>0730-1800</td><td>70</td><td>85</td></tr> <tr> <td>1800-2000</td><td>65</td><td>80</td></tr> <tr> <td>2000-0630</td><td>45</td><td>75</td></tr> <tr> <td rowspan="4">Saturdays</td><td>0630-0730</td><td>45</td><td>75</td></tr> <tr> <td>0730-1800</td><td>70</td><td>85</td></tr> <tr> <td>1800-2000</td><td>45</td><td>75</td></tr> <tr> <td>2000-0630</td><td>45</td><td>75</td></tr> <tr> <td rowspan="4">Sundays and Public Holidays</td><td>0630-0730</td><td>45</td><td>75</td></tr> <tr> <td>0730-1800</td><td>55</td><td>85</td></tr> <tr> <td>1800-2000</td><td>45</td><td>75</td></tr> <tr> <td>2000-0630</td><td>45</td><td>75</td></tr> </table>		Time	dB L _{Aeq(T)}	dB L _{Amax}	Weekdays	0630-0730	55	75	0730-1800	70	85	1800-2000	65	80	2000-0630	45	75	Saturdays	0630-0730	45	75	0730-1800	70	85	1800-2000	45	75	2000-0630	45	75	Sundays and Public Holidays	0630-0730	45	75	0730-1800	55	85	1800-2000	45	75	2000-0630	45	75	The noise limits are included in the CNVMP which will be submitted with the substantive application.	3.1
	Time	dB L _{Aeq(T)}	dB L _{Amax}																																											
Weekdays	0630-0730	55	75																																											
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	1800-2000	45	75																																											
	2000-0630	45	75																																											

	b) Industrial and commercial receivers <table><tr><th>Time</th><th>dB L_{Aeq(T)}</th></tr><tr><td>0730-1800</td><td>70</td></tr><tr><td>1800-0730</td><td>75</td></tr></table> <i>Note: “(T)” is a representative assessment duration between 10 and 60 minutes.</i> 24.2 Sound levels shall be measured and assessed in accordance with the provisions of NZS 6803:1999 Acoustics Construction Noise.	Time	dB L _{Aeq(T)}	0730-1800	70	1800-0730	75																															
Time	dB L _{Aeq(T)}																																					
0730-1800	70																																					
1800-0730	75																																					
25	25.1 Construction vibration shall comply with the following Project Standards for building damage: <table><tr><th>Type of structure</th><th colspan="3">Short-term vibration</th><th>Long-term vibration</th></tr><tr><th></th><th colspan="3">PPV at the foundation at a frequency of</th><th>PPV at horizontal</th></tr><tr><th></th><th>1 - 10Hz</th><th>1 - 50 Hz</th><th>50 - 100 Hz</th><th>plane of highest floor</th></tr><tr><th></th><th>(mm/s)</th><th>(mm/s)</th><th>(mm/s)</th><th>(mm/s)</th></tr><tr><td>Commercial/Industrial</td><td>20</td><td>20 – 40</td><td>40 – 50</td><td>40</td></tr><tr><td>Residential/School/Transpower structures</td><td>5</td><td>5 – 15</td><td>15 – 20</td><td>15</td></tr><tr><td>Historic or sensitive structure</td><td>3</td><td>3 – 8</td><td>8 – 10</td><td>8</td></tr></table>	Type of structure	Short-term vibration			Long-term vibration		PPV at the foundation at a frequency of			PPV at horizontal		1 - 10Hz	1 - 50 Hz	50 - 100 Hz	plane of highest floor		(mm/s)	(mm/s)	(mm/s)	(mm/s)	Commercial/Industrial	20	20 – 40	40 – 50	40	Residential/School/Transpower structures	5	5 – 15	15 – 20	15	Historic or sensitive structure	3	3 – 8	8 – 10	8	The criteria should be amended to reflect the current best practice criteria. The building damage (condition 25) and amenity (condition 26) criteria should be combined in one table as set out below. This table is included in the CNVMP. The proposed criteria in the table generally reflect the existing designation conditions, and we recommend that they be complied with as far as practicable. Lower amenity criteria are applied for occupied dwellings. Higher criteria apply at buildings that are not occupied at the time of construction. The criteria are based on the British Standard and are also designed to avoid damage to buildings. The criteria are different to those of the German Standard on which the 5 mm/s PPV criterion is based. The German Standard is a particularly conservative standard with particularly low criteria, so applying criteria from a different standard does not mean that buildings will be adversely affected. The criteria in the table below have been used successfully and consistently for a large number of projects, including all Te Tupu Ngātahi Supporting Growth project that included NZTA as the requiring authority, and a significant number of major state highway projects in Auckland and across New Zealand.	3.2
Type of structure	Short-term vibration			Long-term vibration																																		
	PPV at the foundation at a frequency of			PPV at horizontal																																		
	1 - 10Hz	1 - 50 Hz	50 - 100 Hz	plane of highest floor																																		
	(mm/s)	(mm/s)	(mm/s)	(mm/s)																																		
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Residential/School/Transpower structures	5	5 – 15	15 – 20	15																																		
Historic or sensitive structure	3	3 – 8	8 – 10	8																																		

	Note: Standard DIN 4150-3:1999 defines short-term (transient) vibration as "vibration which does not occur often enough to cause structural fatigue and which does not produce resonance in the structure being evaluated". Long-term (continuous) vibration is defined as all other vibration types not covered by the short-term vibration definition. 25.2 Construction vibration shall be measured in accordance with German Standard DIN 4150-3:1999.	<table> <tr> <th>Receiver</th><th>Details</th><th>Category A</th><th>Category B</th></tr> <tr> <td rowspan="2">Occupied Activities sensitive to noise</td><td>Night-time 2000h – 0630h</td><td>0.3mm/s ppv</td><td>1mm/s ppv</td></tr> <tr> <td>Daytime 0630h – 2000h</td><td>1mm/s ppv</td><td>5mm/s ppv</td></tr> <tr> <td>Other occupied buildings</td><td>Daytime 0630h – 2000h</td><td>2mm/s ppv</td><td>5mm/s ppv</td></tr> <tr> <td rowspan="2">All other buildings</td><td>At all other times Vibration transient</td><td>5mm/s ppv</td><td>BS 5228-2* Table B2</td></tr> <tr> <td>At all other times Vibration continuous</td><td>5mm/s ppv</td><td>BS 5228-2* 50% of Table B2 values</td></tr> </table> <i>* BS 5228-2:2009 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration'</i>	Receiver	Details	Category A	Category B	Occupied Activities sensitive to noise	Night-time 2000h – 0630h	0.3mm/s ppv	1mm/s ppv	Daytime 0630h – 2000h	1mm/s ppv	5mm/s ppv	Other occupied buildings	Daytime 0630h – 2000h	2mm/s ppv	5mm/s ppv	All other buildings	At all other times Vibration transient	5mm/s ppv	BS 5228-2* Table B2	At all other times Vibration continuous	5mm/s ppv	BS 5228-2* 50% of Table B2 values	
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	At all other times Vibration continuous	5mm/s ppv	BS 5228-2* 50% of Table B2 values																						
26	26.1 Between the hours of 7am and 10pm vibration generated by construction activities shall not exceed: a) A Peak Particle Velocity (PPV) of 1mm/s as measured on the floor of the receiving room for residentially occupied habitable rooms, bedrooms in temporary accommodation and medical facilities; and b) A Peak Particle Velocity (PPV) of 2mm/s as measured on the floor of the receiving room for retail and office spaces (including work areas and meeting rooms). The limits in Condition 26.1 shall only be investigated and applied upon the receipt of a complaint from any building occupant. They shall not be applied where there is no concern from the occupant of the building	Obsolete as covered in the table above.	3.2																						

27	<i>For the avoidance of doubt, this condition is applicable to the management of construction noise and vibration on all receivers, including sensitive receivers.</i> 27.1 A Construction Noise and Vibration DWP shall be prepared. The objective of the Construction Noise and Vibration DWP is to provide a framework for the development and implementation of an identified best practicable option to avoid, remedy or mitigate the adverse effects of noise and vibration resulting from construction. 27.2 The Construction Noise and Vibration DWP shall: - Adopt the noise and vibration standards for construction set out in Conditions 24, 25 and 26 of these designations; - Identify the best practicable option to avoid, remedy or mitigate adverse effects on a receiver resulting from construction noise or vibration that does not comply with the project standards set out in conditions 24, 25 and 26; - Identify measures to ensure that construction activities do not result in ground instability that would likely damage or undermine the structural integrity of any neighbouring structures; and - Identify methods to achieve best practicable option for mitigating adverse effects in accordance with section 17 of the RMA. 27.3 To achieve this objective, the Construction Noise and Vibration DWP shall include: - The roles and responsibilities of the noise and vibration personnel in the contractor team with regard to managing and monitoring adverse noise and vibration effects;	This condition is fulfilled by the CNVMP that is submitted with this assessment. Individual sections of the CNVMP are referenced to cover condition 27.2. Notes: Condition 27.2(c) is not relevant in a CNVMP as it belongs into a geotechnical report. We have not covered this section in the CNVMP. Condition 27.3(b) is not reasonable as these works may require roads to be closed, which may not be able to be done during daytime. The effects of any potential piling or road cutting will be managed through the CNVMP and/or Schedules. Construction in the road is permitted by the AUP to exceed the relevant noise limits where it is not practicable to achieve compliance (AUP E25.6.29). We have not included this requirement in the CNVMP. The effects will be similar to those of permitted works in the road that can be expected across the Auckland region. We have added content to the CNVMP that was not required by the previous conditions but represents best practice, such as: - Procedures and requirement for the preparation of a Schedule to the CNVMP (Schedule) for those areas where compliance with the noise and/or vibration criteria is not practicable - Methods and programme of desktop and field audits and inspections to ensure that the CNVMP, Schedules and the best practicable option for the management of effects are implemented and - Requirements of the review and update of the CNVMP.	3.1, 3.2 7, 8 n/a 7, 8 1.2
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	b) That piling and road cutting will be restricted to between the hours of 7am to 7pm, Monday to Saturday; c) Construction machinery and equipment to be used and their operating noise levels; d) Identification of construction activities that are likely to create adverse noise and vibration effects, the location of these in the construction site areas, and the distance to comply with the Project Criteria in Conditions 24, 25 and 26; e) The timing of construction activities that are likely to create an adverse noise and vibration effect; f) The proximity of neighbouring noise and vibration sensitive areas; g) The process of community liaison; h) Specific training procedures for construction personnel including: i. Information about noise and vibration sources within the construction area and the locations of sensitive noise and vibration areas; and ii. Construction machinery operation instructions relating to mitigating noise and vibration; i) Methods and measures to mitigate adverse noise and vibration effects including, but not limited to, structural mitigation such as barriers and enclosures, the scheduling of high noise and vibration construction, use of low noise and vibration machinery, temporary relocation of affected receivers or any other measures or offer agreed to by the Requiring Authority and the affected receiver; j) The proposed methods for monitoring construction noise and vibration to be undertaken by a suitably qualified person for the duration of construction works including: i. Updating the predicted noise and vibration contours based on the final design and construction activities;		n/a 5.1 5.1, 6.1 2.3 4 9 7.1 7, 8 10 The CNVMP
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	ii. Confirm which buildings are to be subject to a pre and post building condition survey in accordance with Condition 30; iii. Identifying appropriate monitoring locations for receivers of construction noise and vibration; iv. Procedures for working with the Stakeholder Engagement Manager to respond to complaints received on construction noise and vibration, including methods to monitor and identify noise and vibration sources; v. Procedures for monitoring construction noise and vibration and reporting to the Auckland Council Consent Monitoring officer; and vi. Procedures for how works will be undertaken should they be required as a result of the building condition surveys; k) Cross references to the specific sections in the Stakeholder Engagement Plan which detail how landowners and occupiers are to be communicated with around noise and vibration effects.		10.4 10.2, 10.3 9.3 10 10.4 9
30	30.1 Prior to construction of a stage a building condition survey will be undertaken where it is assessed that there is potential for damage to buildings or structures arising from construction as determined by an independent suitably qualified person appointed by Auckland Transport based on the criteria below unless the relevant industry criteria applied at the time or heightened building sensitivity or other inherent building vulnerability requires it. Factors which may be considered in determining whether a building condition survey will be undertaken include: a) Age of the building; b) Construction types; c) Foundation types; d) General building condition; e) Proximity to any excavation;	We consider this condition to be too extensive for the Project. This is a standard road upgrade in an urban/suburban area. This condition has its genesis in conditions that were adopted for the City Rail Link Project where works were being undertaken underground and in extremely close proximity to multistorey buildings. The works proposed are standard road works that are employed across Auckland during any resurfacing works that are routinely done and permitted by the AUP. The only area where building condition surveys may be required are where houses are close to the works. We have recommended within 24m of the road edge where vibratory rolling is required, which represents a predicted vibration level of 3 mm/s PPV, well below the 5 mm/s PPV to avoid any damage to buildings. This distance is based on a 100% safety margin, making it a conservative distance.	10.4

	f) Whether the building is earthquake prone; and g) Whether any basements are present in the building. 30.2 Where prior to construction it is determined that a Building Condition Survey is required in accordance with Condition 30.1: a) The Requiring Authority shall employ a suitably qualified person to undertake the building condition surveys and that person shall be identified in the CEMP(s); b) The Requiring Authority shall provide the building condition survey report to the relevant property owner within 15 working days of the survey being undertaken, and additionally it shall notify and provide the Auckland Council Consent Monitoring officer a copy of the completed survey report; c) The Requiring Authority shall contact owners of those buildings and structures where a Building Condition Survey is to be undertaken to confirm the timing and methodology for undertaking a pre-construction condition assessment; d) The Requiring Authority shall record all contact, correspondence and communication with owners and this shall be available on request for the Auckland Council Consent Monitoring Officer; e) Should agreement from owners to enter property and undertake a condition assessment not be obtained within 3 months from first contact, then the Requiring Authority shall not be required under these designation conditions to undertake these assessments; f) The Requiring Authority shall undertake a visual inspection during "active construction" if requested by the building owner where a pre-construction condition assessment has been undertaken;	The requirements for building condition surveys are set out in the CNVMP. Where appropriate, a Schedule will be prepared, which sufficiently address any potential issues.	
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	g) The Requiring Authority shall develop a system of monitoring the condition of existing buildings which is commensurate with the type of the existing building and the proximity of the Redoubt Road - Mill Road Corridor Project works. The purpose of monitoring is to assess whether or not active construction is compromising the structural integrity of the building; and h) The Requiring Authority shall, during the Building Condition Survey, determine whether the building is classified as Commercial / Industrial / School or a Historic or sensitive structure in terms of Condition 25. 30.3 During construction: a) The Requiring Authority shall implement procedures that will appropriately respond to the information received from the monitoring system. Where necessary this may include the temporary cessation of works in close proximity to the relevant building until such time as measures are implemented to avoid further damage or compromise of the structural integrity of the building; and b) Any damage to buildings or structures shall be recorded and repaired by the Requiring Authority and costs associated with the repair will be met by the Requiring Authority. 30.4 Following construction: a) The Requiring Authority shall, within 12 months of the commencement of operation of the stage, contact owners of those buildings and structures where a Building Condition Survey was undertaken to confirm the need for undertaking a post-construction condition assessment; b) Where a post-construction building condition survey confirms that the building has deteriorated as the result of		
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	construction or operation works relating to the Redoubt Road - Mill Road Corridor Project, the Requiring Authority shall, at its own cost, rectify the damage; and c) Where the Requiring Authority is required to undertake building repairs in accordance with Conditions 30.3(b) or 30.4(b), such repairs shall be undertaken as soon as practicably possible and in consultation with the owner of the building.		
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6 OUTLINE PLAN REQUIREMENTS

We have prepared a CNVMP with input from the contractor, which responds to all relevant requirements of the designation conditions relating to the CNVMP and Schedules and adds several further requirements that we consider to be best practice. Where we have recommended a different approach to that contained in the conditions, these are discussed in the table in Section 5 above.

7 CONCLUSION

We have reviewed the proposed amendments to the designations of the Mill Road Stage 1 project. The changes to the designation boundaries or road layout are predicted to generally result in a reduction in construction noise and vibration effects. This is particularly the case where retaining walls are no longer required and instead are replaced by embankments. The significant change of alignment that provides for a bridge across Mill Road at the southern end of the Project is predicted to have no significant adverse impact on construction noise and vibration.

There are a small number of designation boundary adjustments that will result in additional houses being removed. Where this is the case, houses behind may lose some shielding from construction works which may result in higher noise levels during construction than was previously anticipated. However, for these houses, compliance with the daytime noise limits would be achieved at all times.

We have recommended updated conditions that better reflect the current best practice and take account of the fact that a final Construction Noise and Vibration Management Plan (with input from the contractor) has been provided together with this report. The conditions would require compliance with the CNVMP and provide for Schedules to be prepared for each instance where the relevant noise or vibration criteria cannot be practicably met. This approach has been used for several years on large roading projects and provides for a proactive and responsive management approach with good community outcomes.

APPENDIX A STATEMENT OF QUALIFICATIONS AND EXPERIENCE AND CODE OF CONDUCT

Qualifications

My full name is Siiri Wilkening. I am the author of the report.

I am a director of Marshall Day Acoustics and a Fellow of the Acoustical Society of New Zealand. I am also a member of the Resource Management Law Association and a member of the Institute of Directors of NZ.

I hold a Master's degree in Environmental Engineering (Land Improvement and Environmental Protection) from the University of Rostock, Germany. I have nearly 30 years' experience in acoustic engineering in Germany and New Zealand, specialising in environmental noise control with a particular focus on roads and construction.

My work and expertise relate to a wide range of environmental noise and vibration sources, such as road traffic, construction, rail, ports, quarries, industrial and power generation activities and educational facilities. I was also involved in the development and testing of NZS 6806 (the New Zealand road-traffic noise standard).

My expertise in road traffic noise, particularly in New Zealand, is extensive. I have been the lead acoustician on many major roading projects including Roads of National Significance (RoNS). Projects that were authorised through a Board of Inquiry, where I appeared as an expert witness for NZTA, are SH1 MacKays to Peka (Kāpiti Coast), East West Link, SH1 Northern Corridor Improvements, SH20 Waterview Connection and SH1 Puhoi to Warkworth (Auckland). Other examples of major roads I have been or am the lead acoustician are SH2 Takitimu North Link Stages 1 and 2 (Hawkes Bay/Tauranga), SH1 Southern Corridor from Manukau to Bombay (Auckland), several of the designations authorised through Te Tupu Ngātahi Supporting Growth (Auckland) on behalf of Auckland Transport and NZTA and SH1 Cambridge to Piarere (Waikato).

I have given evidence at council hearings, in the Environment Court, the Arbitration Court and before five Boards of Inquiry. I have also taken part in Environment Court mediations.

Code of Conduct

Although this matter is not before the Environment Court, I, Siiri Wilkening, confirm that I have read the Code of Conduct for expert witnesses as contained in section 9 of the Environment Court Practice Note 2023. I agree to comply with that Code. My qualifications as an expert are set out above. I am satisfied that the matters which I address in this report are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

s9(2)(a)

Siiri Wilkening

August 2026

APPENDIX B GLOSSARY OF TERMS

Acronym/Term	Definition
The Application	Substantive application for Stage 1 of the Mill Road Project.
BS 5228:2009	British Standard BS 5228:2009 “Code of practice for noise and vibration control on construction and open sites, Part 1: Noise, Part 2: Vibration”.
CNVMP	Construction Noise and Vibration Management Plan.
dB	Decibel (dB) is the unit of sound level. Expressed as a logarithmic ratio of sound pressure (P) relative to a reference pressure (Pr), where $dB = 20 \times \log(P/Pr)$.
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) to more closely approximate the frequency bias of the human ear. A-weighting is used in airborne acoustics.
DIN 4150-3:2016	German Standard DIN 4150-3:2016 “Vibrations in buildings – Part 3: Effects of vibration on structures”.
L_{Aeq} (t)	The equivalent continuous (time-averaged) A-weighted sound level commonly referred to as the average level. The suffix (t) represents the period, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{AFmax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
MDA	Marshall Day Acoustics.
Noise	A sound that is unwanted by, or distracting to, the receiver.
NZS 6803:1999	New Zealand Standard NZS 6803: 1999 “Acoustics - Construction Noise”.
PPV	Peak Particle Velocity (PPV) is the measure of the vibration amplitude, zero to maximum, measured in mm/s.
The Project	Stage 1 of the Mill Road Project.
Vibration	When an object vibrates, it moves rapidly up and down or from side to side. The magnitude of the sensation when feeling a vibrating object is related to the vibration velocity. Vibration can occur in any direction. When vibration velocities are described, it can be either the total vibration velocity, which includes all directions, or it can be separated into vertical (up and down vibration), horizontal transverse (side to side) and horizontal longitudinal direction (front to back) components.