



Construction Noise and Vibration Assessment

3 Pigeon Mountain Road, Half Moon Bay, Auckland 2012

HND HMB LTD

Prepared by:

SLR Consulting NZ Ltd

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Basis of Report

This report has been prepared by SLR Consulting NZ Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with HND HMB LTD (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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Table of Contents

Basis of Report	i
Acronyms and Abbreviations	iii
1.0 Introduction	1
2.0 Project Description and Site Location	1
3.0 Performance Standards	4
3.1 Construction Noise	4
3.2 Construction Vibration	5
4.0 Construction Assessment	5
4.1 Proposed Construction Works	5
4.2 Construction Noise	9
4.3 Construction Vibration	13
4.4 Management and Mitigation of Construction Noise and Vibration Effects	14
5.0 Recommended Conditions of Consent	16
6.0 Conclusion	17

Tables in Text

Table 1 Summarised List of Identified Receivers (Rx)	2
Table 2 Construction Noise Levels For Activities Sensitive to Noise in a Residential Zone4	
Table 3 Construction Vibration Human Amenity Limits	5
Table 4 Plant Items and Typical Noise Emission Levels	9
Table 5 Plant Items and Typical Vibration Levels	13

Figures in Text

Figure 1 Proposed Site Layout	1
Figure 2 Aerial Showing Subject Site, Surrounding Area and Receiver's Location.....	3
Figure 3 Anticipated Location for Demolition Works.....	6
Figure 4 Anticipated Location of Excavation (cut and fill) Works	7
Figure 5 Anticipated Location of Compaction Works.....	7
Figure 6 Anticipated Location of Piling Works	8
Figure 7 Location of Stockpiling Works	8
Figure 8 Minimum Recommended Temporary Acoustic Screening Locations.....	11
Figure 9 Example Setup of Localised Acoustic Screening	12
Figure 10 Example Setup of Acoustic Shroud Around Breaker Attachment	12



Acronyms and Abbreviations

Term	Description
'A' weighted	A frequency adjustment which represents how humans hear sounds.
Ambient noise level	The all-encompassing sound associated with an environment or area.
AUP	Auckland Unitary Plan Operative in part
dB	Decibel
dBA	'A' weighted decibel
DIN 4150-3	German Industrial Standard DIN 4150-3 (1999): Structural vibration – Part 3 Effects of vibration on structures.
Free field	A monitoring location where the microphone is positioned sufficiently far from nearby surfaces for the measured data to not be influenced by reflected noise.
Hz	Hertz
Impulsive noise	Noise with a high peak of short duration, or sequence of peaks.
Intermittent noise	Noise which varies in level with the change in level being clearly audible.
L₉₀, L₁₀, etc.	Statistical exceedance levels, where LN is the sound pressure level exceeded for N% of a given measurement period.
LAeq	The 'A' weighted equivalent noise level. It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.
L_{Amax}	The A' weighted maximum sound pressure level of an event.
Low frequency	Noise containing energy in the low frequency range.
L_p or SPL	Sound Pressure Level.
L_w or SWL	Sound Power Level.
NZS 6801:2008	New Zealand Standard NZS 6801:2008 "Measurement of Environmental Sound".
NZS 6802:2008	New Zealand Standard NZS 6802:2008 "Assessment of Environmental Noise".
NZS 6803:1999	New Zealand Standard NZS 6803:1999 "Acoustics – Construction Noise".
Octave-band	A frequency band where the highest frequency is twice the lowest frequency.
Rating level	A derived level used for comparison with a noise limit.
R_w	Weighted Sound Reduction Index of a building element. That is, the laboratory tested (or theoretically calculated) sound insulation performance of a single element.
Tonality	Noise containing a prominent frequency.



1.0 Introduction

HND HMB LTD (the **applicant**) proposes to construct a residential development at 3 Pigeon Mountain Road in Half Moon Bay, Auckland.

SLR Consulting NZ Ltd (**SLR**) has been commissioned to undertake an assessment of acoustic effects associated with the proposal, to evaluate compliance with relevant rules and, if necessary, to identify appropriate additional noise control measures to achieve compliance with the Auckland Council requirements.

2.0 Project Description and Site Location

The proposal comprises construction of 62 residential units (combination of standalone dwellings and terraced houses) and the layout¹ of this proposed development is shown in **Figure 1** for reference. The construction activities associated with the proposal are outlined in **Table 1** which also provides information on the surrounding receivers and their approximate distances from the nearest expected construction activities.

Figure 1 Proposed Site Layout



¹ Shape Architects: Site Plan, project no 207, dwg no A 1.02, dated 07/04/26.



Based on the Auckland Unitary Plan Operative in Part (**the AUP**), the subject site and sites on the western, southern and eastern sides are located on land zoned *Residential – Mixed Housing Suburban*. To the north across Ara-Tai Road are commercial activities linked to the Half Moon Bay Marina (see **Figure 2**).

Table 1 Summarised List of Identified Receivers (Rx)

Rx	Address	Approximate Distance to Closest Activity, meters					Comment
		Demolition	Excavation	Stockpiling	Piling	Compaction	
R01	14 Poseidon Place	35	35	75	29	48	Two-storey dwelling
R02	12 Poseidon Place	31	34	70	30	52	Two-storey dwelling
R03	10 Poseidon Place	28	33	70	28	55	Two-storey dwelling
R04	8 Poseidon Place	36	40	80	38	37	Two-storey dwelling
R05	6A Poseidon Place	45	46	90	41	43	One-storey dwelling
R06	4 Poseidon Place Half	60	58	105	48	54	Two-storey dwelling
R07	11 Pigeon Mountain Road	38	40	75	28	43	Two-storey dwelling
	2 Compass Point Way	31	35	65	28	42	Two-storey dwelling
R08	4 Compass Point Way	30	35	65	31	46	One-storey dwelling
R09	2/9 Tuscan Place	24	28	50	23	39	One -storey dwelling
	9 Tuscan Place	45	49	80	43	47	Two-storey dwellings
R10	11 Tuscan Place	27	30	55	28	25	Two-storey dwellings
R11	8 Compass Point Way	34	34	60	30	30	Two dwelling
R12	8A Compass Point Way	36	35	75	30	45	Two-storey dwelling
R13	16 Indus Place	32	30	90	26	43	Two-storey dwelling
	16A Indus Place	37	36	90	32	48	Two-storey dwelling
R14	14 Indus Place	46	44	110	42	53	Two-storey dwelling
R15	10 Compass Point Way	34	32	90	31	39	Two-storey dwelling



Rx	Address	Approximate Distance to Closest Activity, meters					Comment
		Demolition	Excavation	Stockpiling	Piling	Compaction	
R16	84 Compass Point Way	6	10	40	6	5	Three - storey dwelling
R17	82 Compass Point Way	16	11	40	6	25	One-storey dwelling
R18	80 Compass Point Way	14	9	38	7	25	Three - storey dwelling
R19	78 Compass Point Way	19	10	40	4	6	Three - storey dwelling
R20	76 Compass Point Way	33	11	50	6	10	Three - storey dwelling

Figure 2 Aerial Showing Subject Site, Surrounding Area and Receiver’s Location



3.0 Performance Standards

3.1 Construction Noise

The total construction duration for the proposed development is expected to exceed 20 weeks. Standard E25.6.27 of the AUP states that noise from construction activities for more than 20 weeks in a *Residential Zone* must not exceed the limits in **Table 2**.

The limits apply 1 m from the façade of any building occupied during the works, which contains an activity sensitive to noise. The AUP defines “*activities sensitive to noise*” as:

Any dwelling, visitor accommodation, boarding house, marae, papakāinga, integrated residential development, retirement village, supported residential care, care centres, lecture theatres in tertiary education facilities, classrooms in education facilities and healthcare facilities with an overnight stay facility.

Table 2 Construction Noise Levels For Activities Sensitive to Noise in a Residential Zone

Time of Week	Time Period	Long-term duration of Construction work	
		LAeq	LAmx
Weekdays	6:30 am – 7:30 am	55	70
	7:30 am – 6:00 pm	70	85
	6:00 pm – 8:00 pm	65	80
	8:00 pm – 6:30 am	40	70
Saturdays	6:30 am – 7:30 am	40	70
	7:30 am – 6:00 pm	70	85
	6:00 pm – 8:00 pm	40	70
	8:00 pm – 6:30 am	40	70
Sundays and public holidays	6:30 am – 7:30 am	40	70
	7:30 am – 6:00 pm	50	80
	6:00 pm – 8:00 pm	40	70
	8:00 pm – 6:30 am	40	70

AUP Objective E25.2 (4) provides that “*Construction activities that cannot meet noise and vibration standards are enabled while controlling duration, frequency and timing to manage adverse effects*”.

In general accordance with the guidance in NZS 6803 (as referenced in the AUP) and the objectives of the AUP, it is common in Auckland to permit higher noise limits during short-term high noise generating activities such as demolition, excavation, piling and compaction provided these are subject to implementation of the best practicable options (**BPO**) to control effects of those activities. This is due to the limited duration of such effects and the limited available options to mitigate associated noise effects from necessary construction activities.



3.2 Construction Vibration

AUP Standard E25.6.30 states that construction activities must be controlled to ensure resulting vibration does not exceed:

- a) the limits set out in DIN 4150-3 when measured in accordance with that Standard on any structure not on the same site; and
- b) the limits in **Table 3** (as transcribed from Table 1 of E25.6.30) in any axis when measured in the corner of the floor of the storey of interest for multi-storey buildings, or within 500 mm of ground level at the foundation of a single storey building.

Table 3 Construction Vibration Human Amenity Limits

Receiver	Period	Peak Particle Velocity Limit ¹
Occupied building containing activity sensitive to noise ²	Night-time 10:00 pm to 7:00 am	0.3 mm/s
Other occupied buildings	Daytime 7:00 am to 10:00 pm	2.0 mm/s
	At all times	2.0 mm/s

1. In any axis direction.

2. As defined in the AUP.

Standard E25.6.30 also states that works generating vibration for three days or less between the hours of 7:00 am to 6:00 pm may exceed the limits above, but must comply with a limit of 5 mm/s peak particle velocity in any axis when measured at the corner of the floor/level of interest within a multi-storey building, or within 500 mm of ground level at the foundation of a single storey building, where:

- All occupied buildings within 50-metres 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.

4.0 Construction Assessment

4.1 Proposed Construction Works

The specific details of the construction plant and methodology are not available at the time of writing. However, based on the information currently available, SLR understands:

- Demolition works are likely to take place within the areas highlighted on **Figure 3**.
- Excavation works are likely to take place within the areas highlighted on **Figure 4**²

² Eighty6 Civil Engineering: Earthworks Cut and Fill Plan, project no FP326, drawing no FP326-210, rev A, dated 28/02/25.



- Compaction works associated with JOAL are envisaged within the locations highlighted on **Figure 5³**.
- Piling works are likely to take place within the areas highlighted in **Figure 6⁴**.
- Locations of stockpiling is show on **Figure 7⁵**.

Figure 3 Anticipated Location for Demolition Works



³ Shape Architects: Proposed Site Plan, project no 207, dwg no A 2.2, dated 15/12/25. .

⁴ Total Ground Engineering, Site Plan, job no J00538, sheet no DWG 010, revision 5, dated 19/12/25.

⁵ Aireys, Site Plan, job no 220571-1, sheet no 201.



Figure 4 Anticipated Location of Excavation (cut and fill) Works

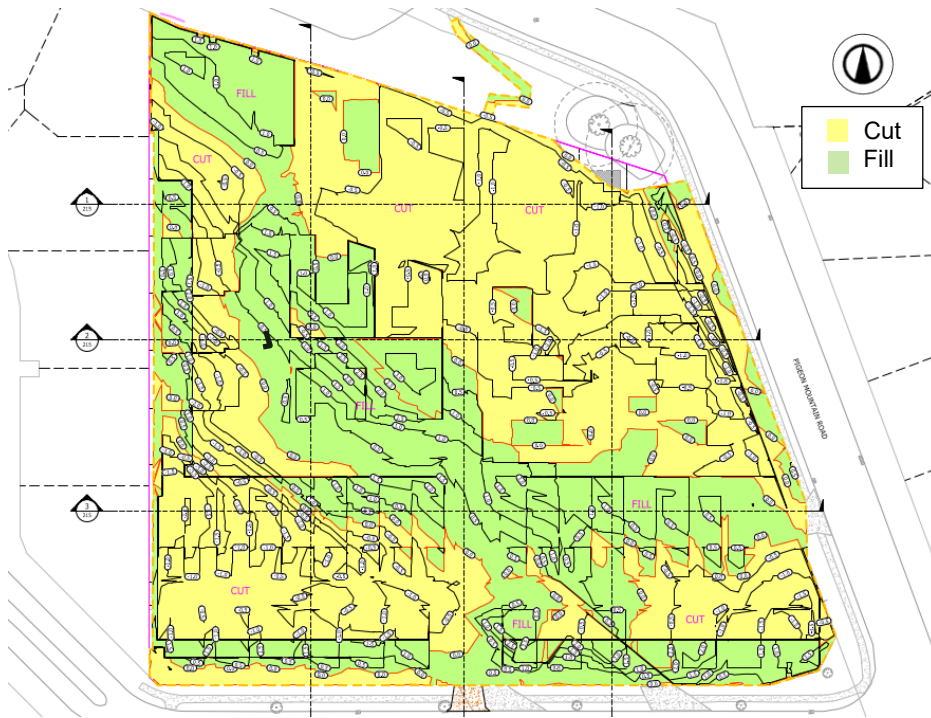


Figure 5 Anticipated Location of Compaction Works



Figure 6 Anticipated Location of Piling Works

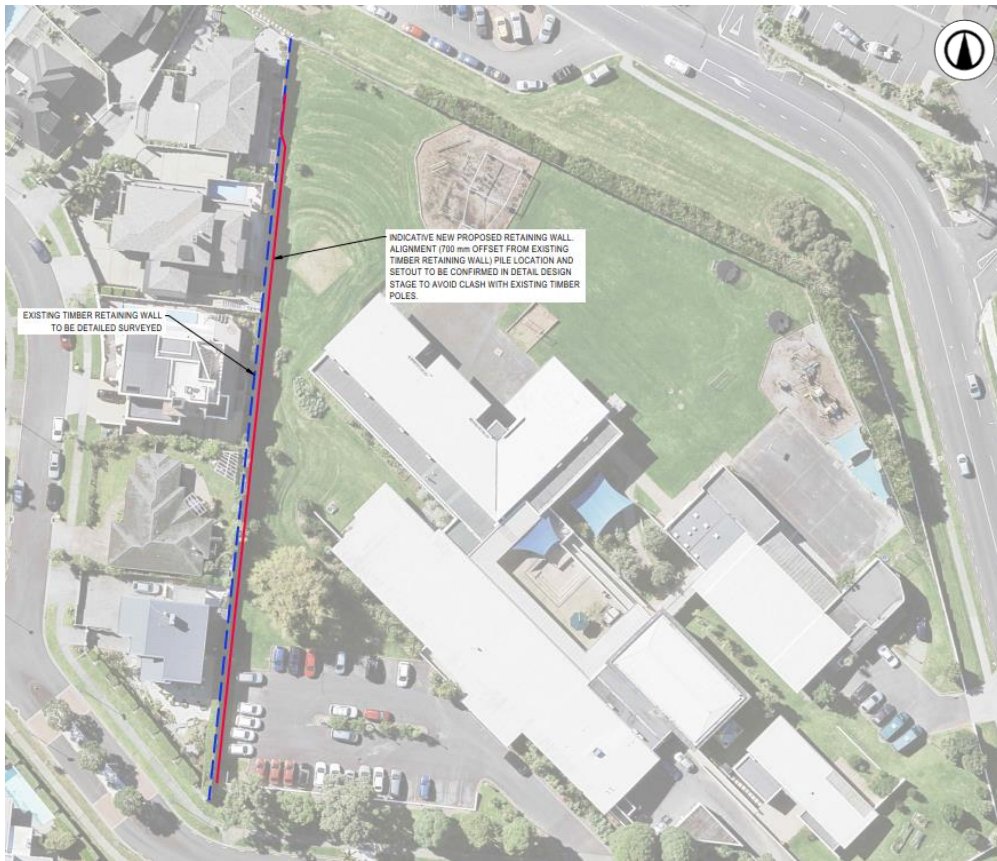
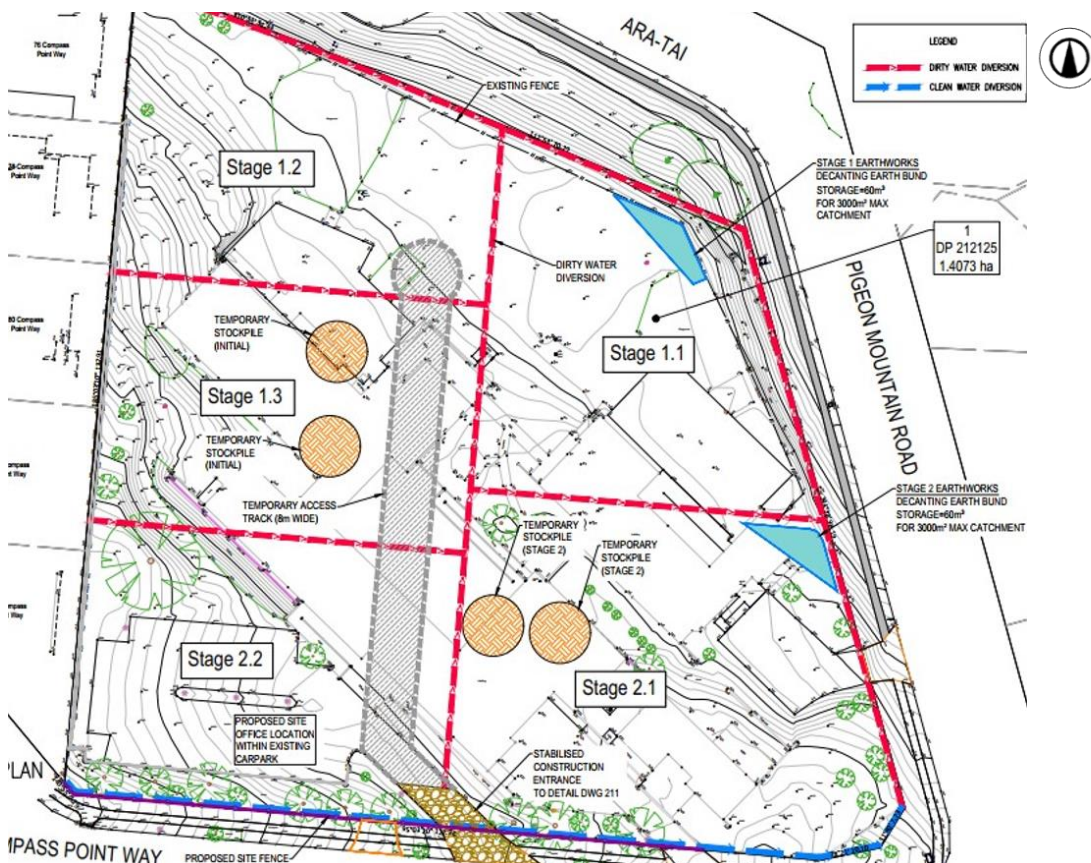


Figure 7 Location of Stockpiling Works



SLR has been advised of the following approximate timeframe for the proposed construction activities:

- Demolition – four to six weeks.
- Excavation – two to three weeks.
- Piling – two to three weeks.
- Compaction – two to three weeks.
- Stockpiling – This will be an ongoing activity throughout the construction phase, with materials being stored and repositioned as required by the project timeline.

4.2 Construction Noise

The highest levels of construction noise during the project are expected to be associated with operation of large machinery – in this case demolition, excavation, piling, and compaction works. A summary of equipment and reference sound pressure levels has been provided in **Table 4**. These sound pressure levels are based on SLR measurements and published data (*BS 5228-1: 2009 'Code of practice for noise and vibration control on construction and open sites – Part 1; Noise'*).

The noted setback distances to compliance have been calculated in accordance with the methodology in NZS 6803 and include façade corrections.

The expected hours of construction works are between 7:30 am to 6:00 pm Monday to Saturday. SLR recommend that there is no operation of high noise-generating, motorised equipment on the site outside of these hours, including on Sundays and public holidays.

It should be noted that the principal noise source associated with excavation (the engine) is typically located 5-metres (and as much as 10-metres) away from the area being excavated due to the available reach of plant. A similar principle applies to bored piling using an attachment on an excavator but with smaller distances (more commonly in the order of 2-metres to 3-metres from the engine to the pile location). These distances are in addition to the noted distances in **Table 1**.

Table 4 Plant Items and Typical Noise Emission Levels

Activity	Plant Items	Plant Noise Level at 10m, dB LAeq	Approximate Setback Distance to Compliance, in metres	
			without mitigation	with mitigation ¹
Demolition	Excavator (≤25T) with pulveriser attachment	75	24	5
	Excavator (≤5T) with a breaker attachment with shroud	75	24	4
Excavation	Excavator (<14 tonnes) with bucket attachment	65	8	2
	Excavator (20-25 tonnes) with bucket attachment	70	14	5



Activity	Plant Items	Plant Noise Level at 10m, dB LAeq	Approximate Setback Distance to Compliance, in metres	
			without mitigation	with mitigation ¹
	Excavator (30-40 tonnes) with bucket attachment	80	43	16
Piling	Excavator (<14 tonnes) with piling attachment	65	8	2
Compaction	Sheepsfoot roller (≤15 tonnes) ²	70	14	5
	Sheepsfoot roller (≤32 tonnes) ²	75	24	5
	Non-vibratory single drum roller (<7 tonnes) ²	65	8	2
	Vibratory single drum roller (<7 tonnes) ²	70	14	4
	Vibratory plate compactor (≤100kg) ²	70	14	3
	Vibratory plate compactor (400kg) ²	75	24	5
Earthworks	Dump Truck (20-30 tonnes)	75-80	24-43	8-16
	Tractor (≤7.5 tonnes) with trailer attachment	70	14	4
	Truck mounted with boom lift	75	24	6
Concreting	Concrete Mixing Truck	75-80	24-43	N/A
	Concrete Pump	75	24	6

Table Notes:

1. Setback distance with mitigation is based on the use of acoustic screening at locations shown on Figure 8.
2. The setback distance for a non-vibratory compactor is based on six vehicle movements (passing by an individual receiver) every 15-minutes as the compactor is expected to be moving across the site and not idling/stationary at one location.



A 2-metre high temporary and localised acoustically effective screen is recommended at the locations shown in **Figure 8** during demolition, excavation, piling, and compaction works. This mitigation measure, in combination with selection of quieter construction equipment and advising neighbours prior to commencing works, can assist in achieving acceptable construction noise and vibration outcomes.

Figure 8 Minimum Recommended Temporary Acoustic Screening Locations

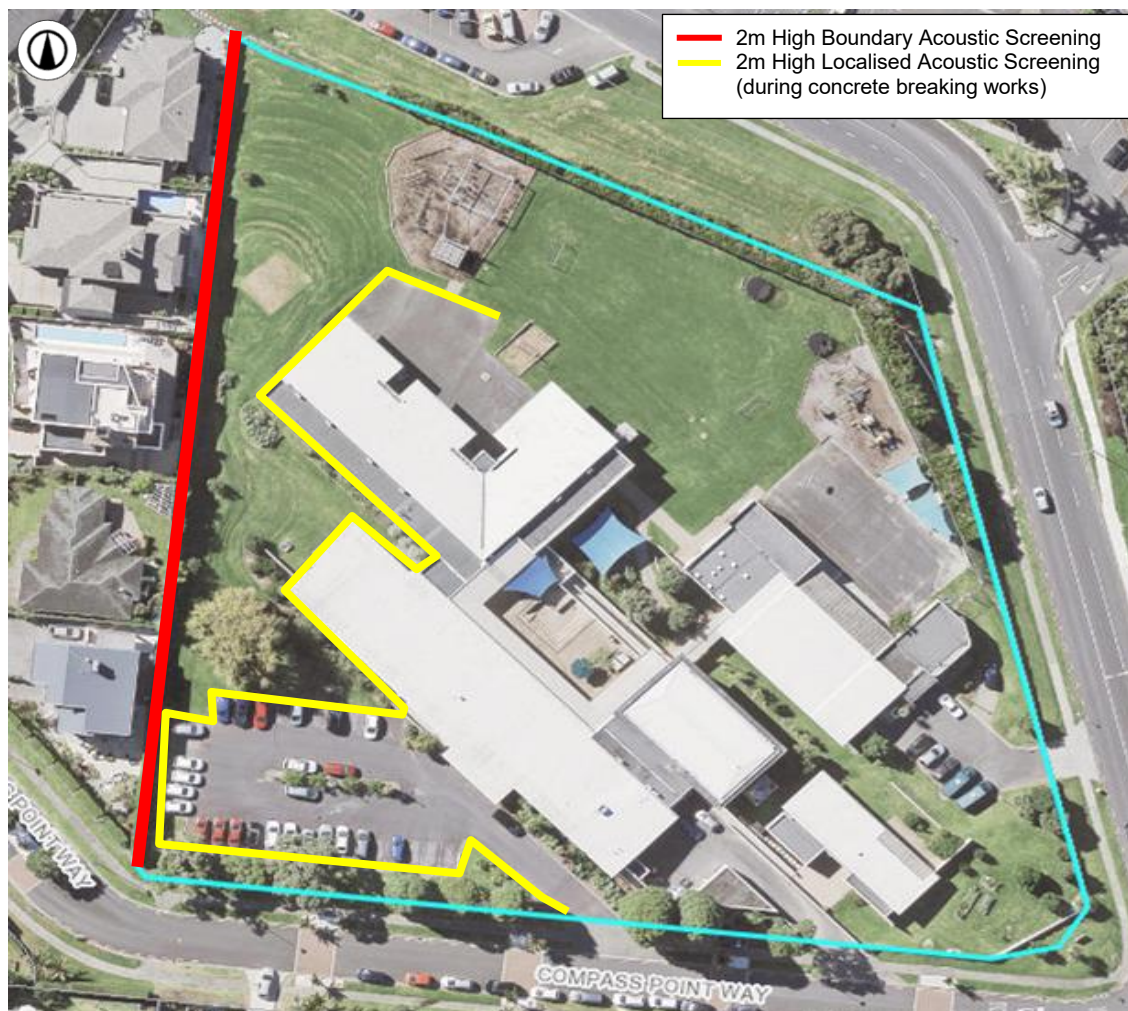


Figure 9 Example Setup of Localised Acoustic Screening



Figure 10 Example Setup of Acoustic Shroud Around Breaker Attachment



With temporary acoustically effective screening (at the locations shown in **Figure 8**) general compliance during construction works is expected at the majority of the surrounding receivers.



However, due to the close proximity and the overlooking nature of the neighbouring building at 84 Compass Point Way (R16), temporary noise exceedance is expected during demolition works. Noise levels of up to 70-75 dB LAeq are expected for approximately four days at the upper floor levels of this property.

Construction Noise Effects

For context, SLR notes that 75 dB LAeq is the AUP permitted noise limit for construction of up to 20 weeks. In SLR's experience, common residential façade elements can typically reduce external noise by 20-25 dB.

At external levels of 75 dB LAeq we would expect internal noise levels in the range of 50-55 dB LAeq. At these levels personal conversations would need slightly raised voices, and TV and radio sound levels would need to be raised, at these levels office type work can generally continue. For reference, an internal level of 55 dB LAeq is the recommended internal reasonable noise limit in NZS 6803: 1999 *Acoustics - Construction Noise* for construction activities lasting between 15 days and 20 weeks, in this instance this level is anticipated to occur for an approximate period of up to four days at 84 Compass Point Way (R16).

Higher noise levels are not uncommon for demolition works, and we note that the predicted noise levels represent the periods when these works are closest to the most exposed receivers. This is expected to be for short periods as described above with quieter periods between as activities change on site.

Section 4.4 outlines management and mitigation options to reduce noise effects to reasonable levels and include consultation with neighbours and installing boundary and localised acoustic screening. The resultant effects of the predicted exceedances, being limited in duration and managed as outlined below, can therefore be considered reasonable.

4.3 Construction Vibration

Table 5 below presents the predicted setback distances to comply with the vibration criteria during the construction works, to avoid cosmetic damage to buildings. These reference levels should be considered indicative only due to the potential difference in machinery and ground conditions etc.

Table 5 Plant Items and Typical Vibration Levels

Activity	Plant Item	Approximate distance to compliance, in metres	
		with 2 mm/s PPV limit	with 5 mm/s PPV limit
Excavation	Excavator (≤14 tonnes) with bucket attachment	1	<1
	Excavator (≤25 tonnes) with bucket attachment	1	<1
	Excavator (35 tonnes) with bucket attachment	4	<2
Piling	Excavator (≤15 tonnes) with bored piling attachment	2	<1



Activity	Plant Item	Approximate distance to compliance, in metres	
		with 2 mm/s PPV limit	with 5 mm/s PPV limit
Compaction	Sheepsfoot roller (≤15 tonnes)	2	1
	Sheepsfoot roller (32 tonnes)	4	2
	Vibratory single drum roller (≤7 tonnes)	15-20	7-8
	Non-vibratory single drum roller (≤7 tonnes)	2	1
	Vibratory plate compactor (≤100kg)	3-4	1-2
	Vibratory plate compactor (400kg)	5	<2

Based on the above equipment, mitigation and management measures outlined in Section 4.4 and distances to work as outlined in Table 1, compliance with the human amenity vibration limits and DIN 4150-3 cosmetic damage limit is readily expected.

Other Activities

There is also potential for the generation of intermittent vibration by dropping heavy objects, running over ledges, or impacting unexpected items. It is not feasible to predict how regularly these events may occur, or what levels of vibration may be generated from these individual events, due to their arbitrary nature. They can, however, be readily minimised or avoided through considered management practices.

4.4 Management and Mitigation of Construction Noise and Vibration Effects

Standard and routinely employed measures shall be implemented to mitigate noise effects. Such measures may include the selection of plant which generates less noise, careful maintenance of plant, controlling 'on-time' of plant and verification monitoring of noise and vibration levels.

SLR has identified the following site-specific mitigation measures which, in combination with advising neighbours prior to commencing works, can be considered BPO and can assist in achieving acceptable construction noise outcomes:

- Temporary acoustic screening to block the line of sight between activities and receivers during demolition, excavation, piling, and compaction works as per **Figure 8**. The temporary acoustic screening should be constructed of solid material such as plywood or mass-loaded 'acoustic blankets' with a surface mass of at least 7 kg/m².
- Dump trucks to be parked or idled no closer than 43-metres from any surrounding occupied receiver.



- **For Demolition works**
 - Works undertaken within 24-metres of the surrounding properties to use a ≤ 5 -ton excavator (breaker wrapped with an acoustic shroud as shown on **Figure 10**) and installing localised screening (as shown on **Figure 9**).
 - For demolition works beyond 24-metres of the surrounding properties, use of a ≤ 25 -ton excavator fitted with a pulveriser is acceptable and does not require acoustic screening.
- **For Excavation and Piling works:**
 - Works undertaken within 8 metres of occupied properties shall be limited to a ≤ 14 T excavator unit, with boundary acoustic screening installed, as shown on **Figure 8**.
 - acoustic screening is not required where the 14T excavator is operated beyond 8 metres from occupied properties.
 - works undertaken within 14-43m of occupied properties shall be limited to a 20-25T excavator and does not require acoustic screening.
 - Works beyond 43 metres can continue with a >25 T excavator and does not require acoustic screening.
- **For compaction works:**
 - Compaction works undertaken within 8 metres of occupied properties shall implement boundary acoustic screening, as shown on Figure 8, and shall be limited to Single drum roller (≤ 7 T) operating on a static mode.
 - Compaction works undertaken between 8 and 24 metres of occupied properties shall implement boundary acoustic screening, as shown on Figure 8, and shall be limited to one of the following items of plant:
 - ≤ 100 kg plate compactor, or
 - ≤ 400 kg plate compactor operating in low vibration mode, or
 - Single drum roller (≤ 7 T) operating in static mode, or
 - Sheepsfoot roller (≤ 1 T) operating in static mode.
 - Compaction works undertaken beyond 24 metres of occupied properties shall not require boundary acoustic screening and may use one of the following items of plant:
 - ≤ 100 kg plate compactor operating in low or high vibration mode, or
 - ≤ 400 kg plate compactor operating in low or high vibration mode, or
 - Single drum roller (≤ 7 T) operating in low or high vibration mode, or
 - Sheepsfoot roller (≤ 32 T) operating in low or high vibration mode.
 - Unnecessary start-up, run-down, revving, and idling of engines near neighbouring buildings shall be avoided.
- **For Concreting works:**
 - Use of extension pipes to pour concrete within 43-metres away from the surrounding receivers
 - Concrete mixing pump to be located at least 24-metres away from the surrounding receivers.



- Concrete mixing truck to be located at least 43-metres away from the surrounding receivers.
- Where practicable, scheduling of the works closest to the neighbouring properties to avoid periods where the buildings are occupied.

5.0 Recommended Conditions of Consent

SLR recommends that specific conditions of consent (if considered necessary) should reflect the standard requirements as set out in the AUP. SLR recommend the following conditions to provide suitable control of construction noise and vibration effects:

- a) The consent holder shall advise all occupants of the immediate neighbouring sites of the construction works, in writing, no less than three (3) days prior to the works commencing on the site. The written advice shall include a brief description of the works, the expected duration of the works, the mitigation to be implemented, the working hours, and contact details for any concerns regarding noise and vibration.
- b) The consent holder shall construct and maintain acoustically effective localised screening throughout the construction works as necessary to meet the noise limits in Conditions [c] below.
- c) Noise arising from construction activities on-site shall not exceed the following limits when measured or assessed at any building on any other site, where affected party approval has not been obtained, that is occupied during the works:

During Demolition Works:

- 75 dB LAeq at 84 Compass Point Way.
- AUP Standard E25.6.27 noise limits at all other properties.

During all other activities:

- AUP Standard E25.6.27 noise limits at all properties.
- d) Vibration from construction activities shall meet the requirements of AUP Standard E25.6.30(1).
 - e) Verification vibration monitoring shall be undertaken at the first instance of compaction works to confirm site specific vibration levels meet the requirements of Condition [d].



6.0 Conclusion

SLR has assessed construction noise and vibration effects associated with the proposed residential development at 3 Pigeon Mountain Road in Half Moon Bay, Auckland. Noise and vibration associated with the construction of the proposed development has been considered with regard to the Auckland Unitary Plan requirements. The findings of the assessment are summarised as follows:

- 1 Noise and vibration levels, generated by construction works, are expected to generally comply with identified permitted construction noise and vibration limits (with reference to Standards referenced in the Auckland Unitary Plan).
- 2 Temporary acoustic screening (minimum height of 2-metres) and limiting the size of equipment used is recommended to control noise at receivers during demolition, excavation, piling, and compaction works.
- 3 Standard E25.6.27 of the AUP relating to long-term construction noise limits may be exceeded temporarily by up to 5 dB during demolition works at 84 Compass Point Way for an approximate period of up to four days.
- 4 The exceedances are predicted to occur for short durations and in some instances are likely to be able to be scheduled at times to avoid when neighbouring properties are occupied. The internal noise levels during this brief period would be expected to be within the range considered reasonable in NZS 6803.
- 5 Standard E25.6.30(1) relating to construction vibration levels is expected to be complied with at neighbouring properties through managing activities and equipment sizes relative to distance from receivers.
- 6 With consideration of the limited duration of these works and the identified mitigation measures (see **Section 4.4**), the associated noise and vibration effects are considered to be reasonable and acceptable.
- 7 Recommended conditions of consent related to noise and vibration have been included in **Section 5.0**.

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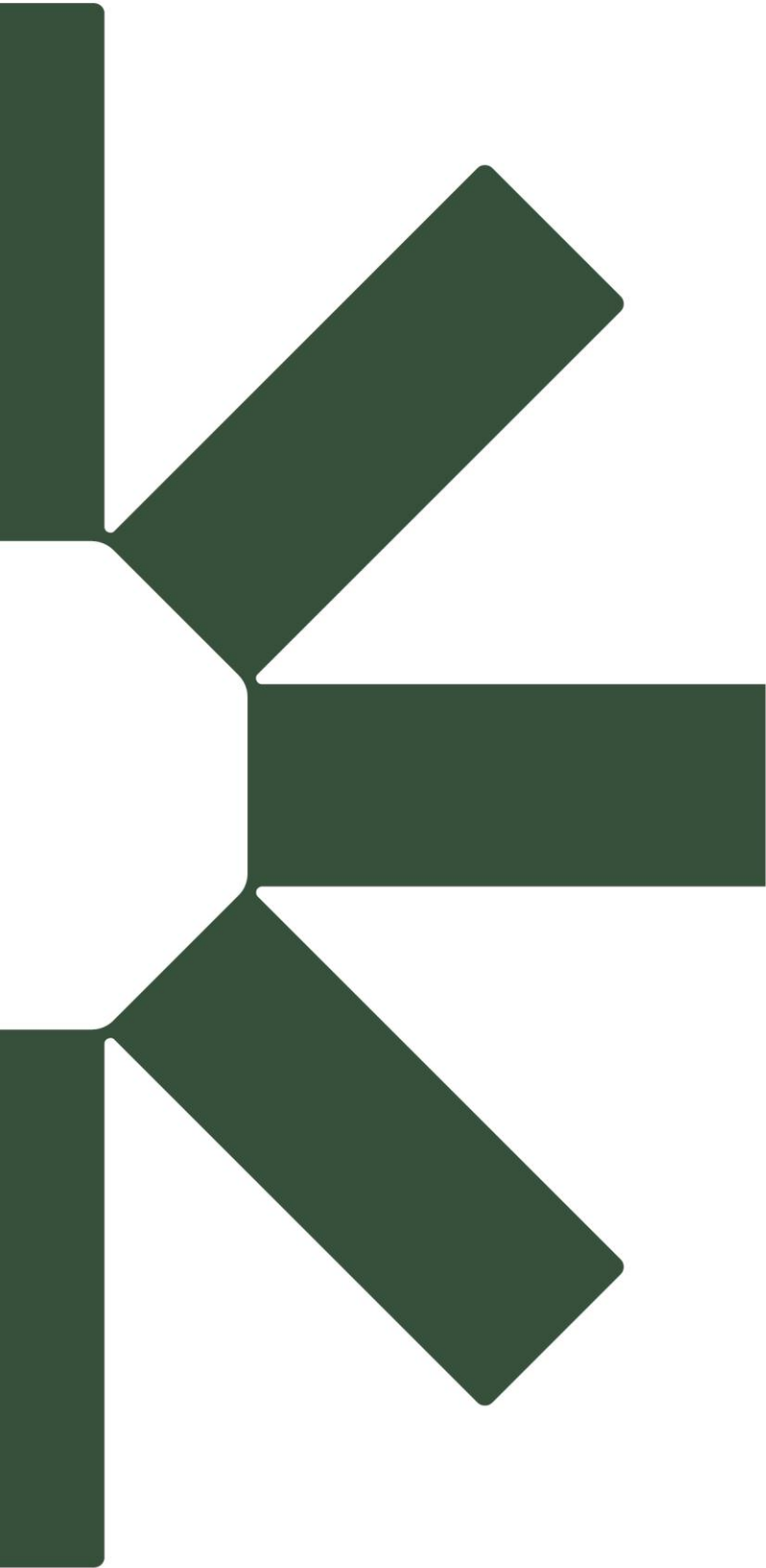


Senior Consultant (MEngNZ, MASNZ)
Senior Consultant - Acoustics and Vibration



Juan Restrepo (MASA, MASNZ)
Principal Consultant - Acoustics and Vibration





Making Sustainability Happen