WEEKLY REPORT

Project:	Te Karearea - Monitoring	**Document No.:**	Wr 08		
To:	Te Karearea Limited	**Date:**	10 March 2025		
Attention:	Alison Esler (Proviso)	**Project No.:**	20241413		
From:	Harry Zhang	**No. Pages:**	8	**Attachments:**	No
Subject:	Weekly Noise and Vibration Monitoring Report (3 March to 9 March 2025)				

This document details the results of the ongoing noise and vibration monitoring of earthworks activities, associated with the construction for the Te Karearea Project, located at 30 Benmore Crescent, Lower Hutt.

The reporting period of this document is from 3 March 2025 to 9 March 2025.

In summary, during the reporting period, there were no infringements of the construction noise limits due to construction activities. We have not identified any events in excess of 0.3mm/s which are a result of construction activities.

A glossary of terminology is included in Appendix A.

Summaries of the locations and functionality of the noise and vibration loggers are included in Appendix B. Appendix B also includes notes on the presentation of measurement results.

NOISE MEASUREMENTS

The relevant details related to construction noise limits are included in Appendix C. During site working hours, the applicable noise limits for construction noise are 70 dB L_{Aeq} and 85 dB L_{AFmax}.

Figure 1 and Figure 2 provide visual summaries of the noise levels measured over the reporting period.

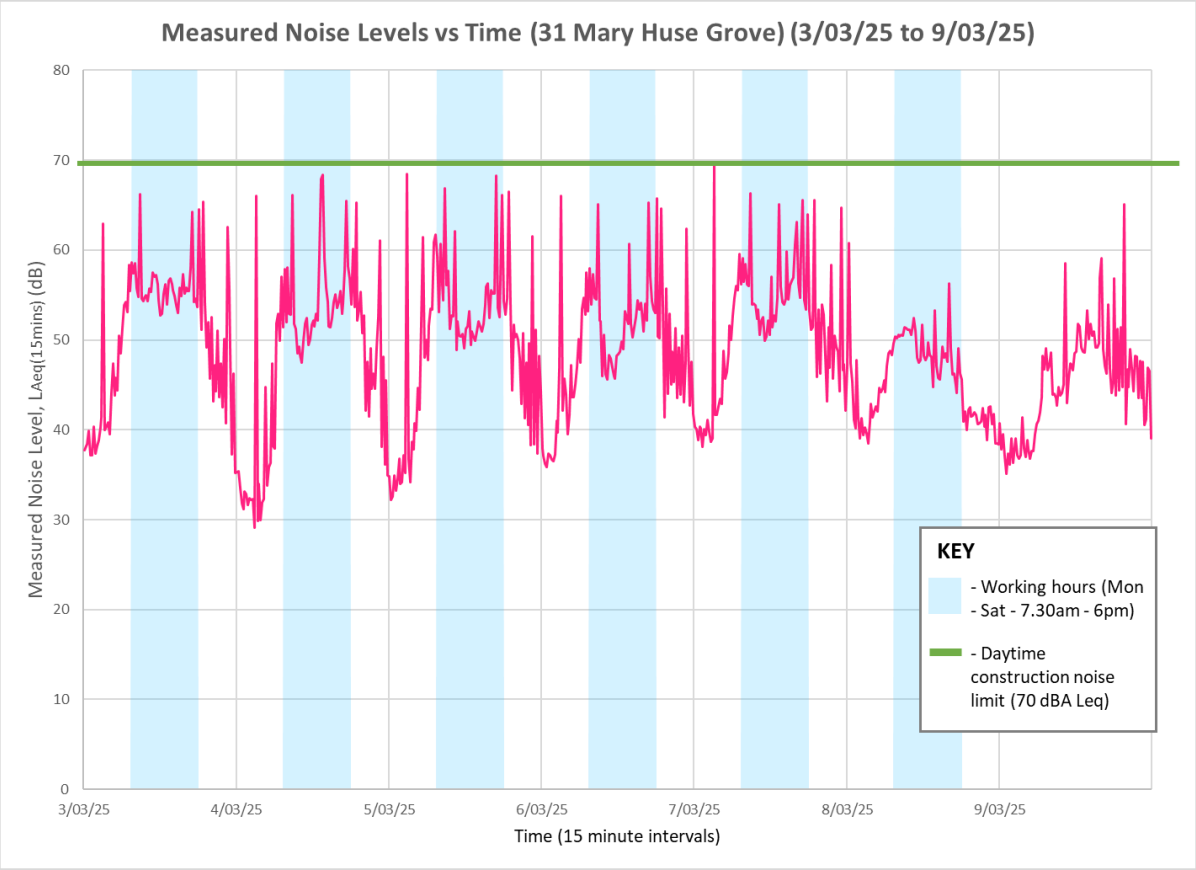

Figure 1: Measured noise levels at 31 Mary Huse Grove logger (ground level). Includes +3 dB adjustment.

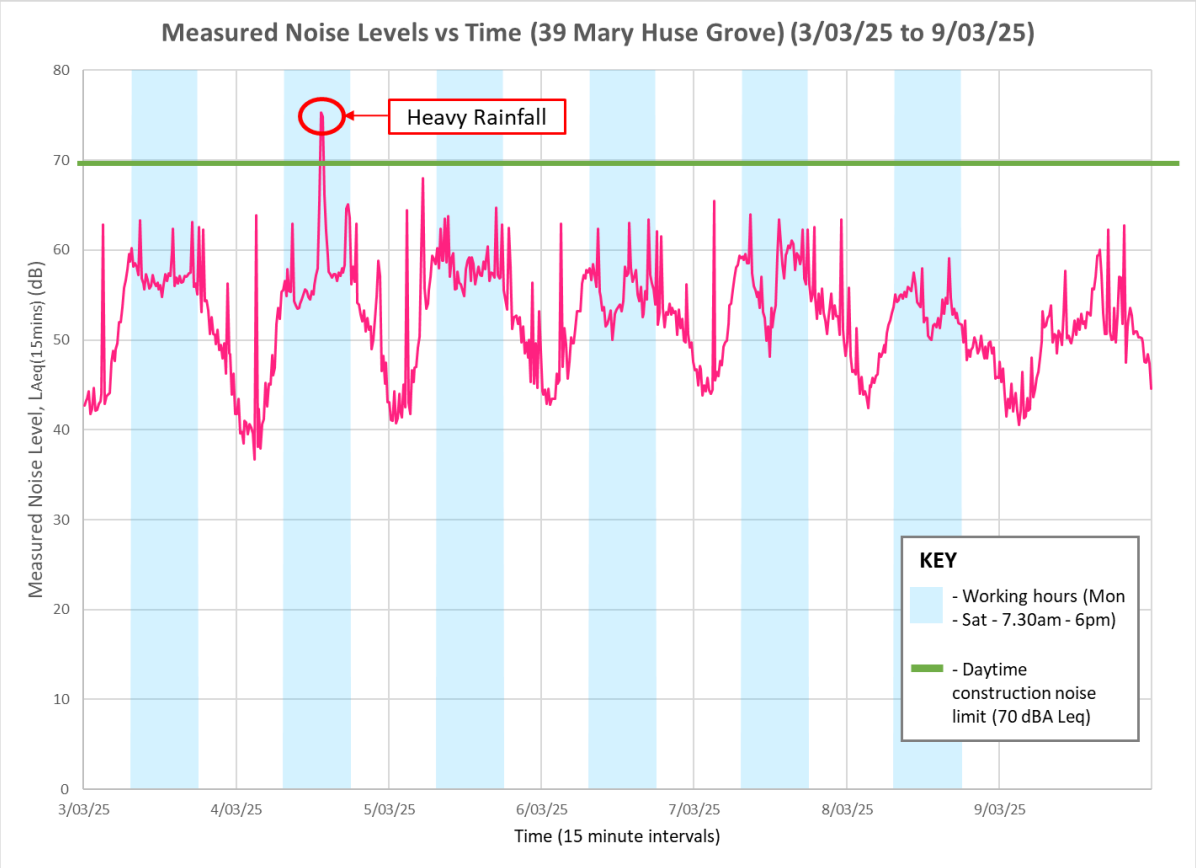

Figure 2: Measured noise levels at 39 Mary Huse Grove logger (first floor). Includes +3 dB adjustment.

We have identified one instance where a noise level in excess of 70 dB $L_{Aeq(15min)}$ was measured during site working hours at the 39 Mary Huse Grove noise logger. Based on an audio recording, we have determined that this was caused by heavy rainfall or similar. We have provided the audio recording with this report.

During the logging period, no infringements of the construction noise limits due to construction activities occurred at either noise logger.

VIBRATION MEASUREMENTS

In respect of vibration, no limit has been provided to us. As the logger is close to the railway line, vibration not associated with the works does occur. Within this memo, we have not removed the train passes. Where a vibration event exceeds 0.3 mm/s, we have carried out a further investigation into the event. The value 0.3 mm/s has been selected as this is considered as 'just perceptible', as described in the standard BS 5228-2:2009. Further details regarding vibration performance standards are included in Appendix D.

Figure 3 provides a visual summary of the vibration levels measured over the reporting period.

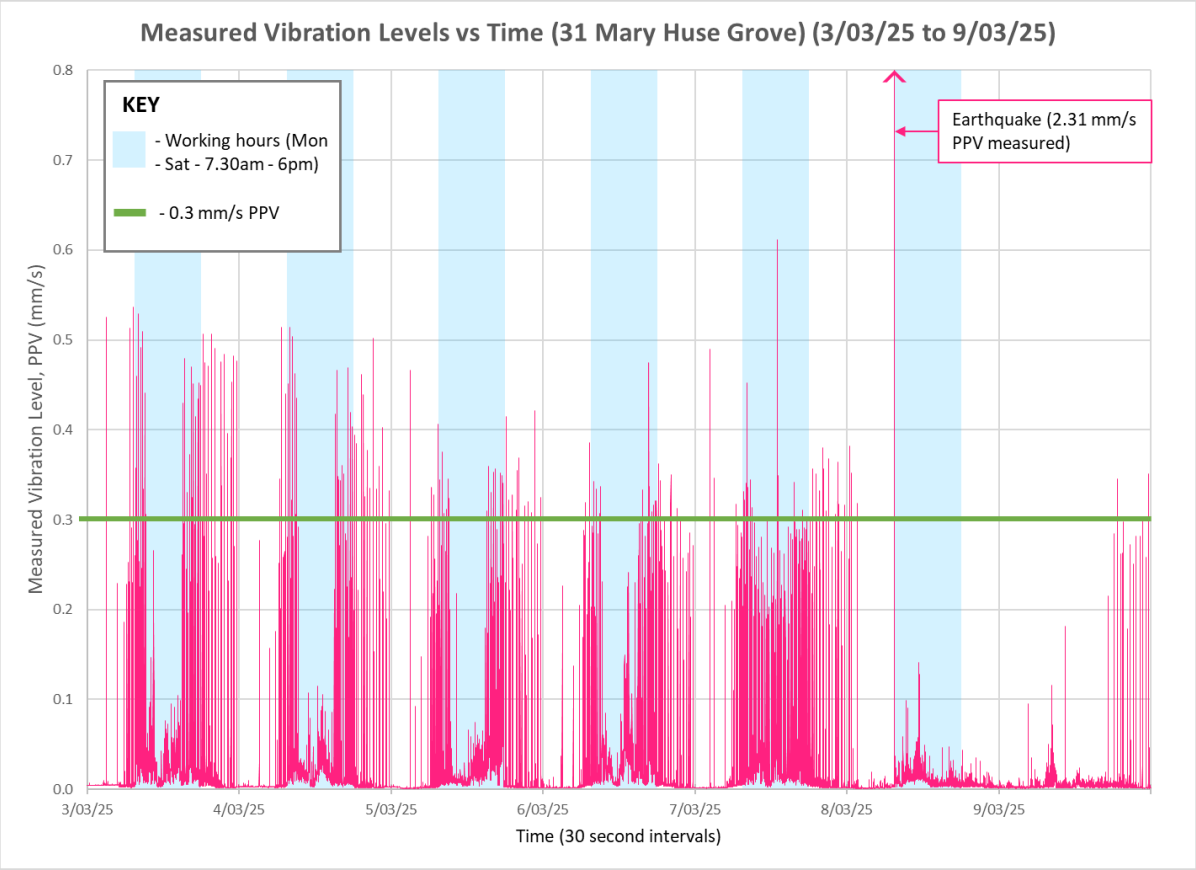

Figure 3: Measured vibration levels at 31 Mary Huse Grove (ground level foundations)

We note that there were many instances where vibration levels during site working hours were in excess of 0.3 mm/s PPV. We have determined that all but two of these were due to train passes on the adjacent rail line. This is based on audio recordings, the duration of each event, and the regularity at which the events occur (coinciding with train timetables).

Based on the profile of vibration data, we have determined that there were two non-train events amongst the instances where vibration in excess of 0.3 mm/s PPV was measured during site working hours. The events occurred on:

- 6 March between 4:40:45 pm and 4:24pm ('non-train event 1')
- 7 March at 1:07:42 pm ('non-train event 2')

There were no audio recordings made during these events. This indicates that noise levels at both noise loggers did not exceed 65 dB L_{AF} during the events.

Figure 4 overleaf shows the highest PPV measured at 1-second intervals around the time of non-train event 1. Based on the profile of the measurement data alone, we are unable to determine the cause of the event. However, it is not consistent with the vibration profiles associated with either a train pass or use of a vibratory roller.

Between 4:41:23 pm and 4:41:55 pm, there appeared to be multiple impulsive events separated by 3 to 5 second intervals.

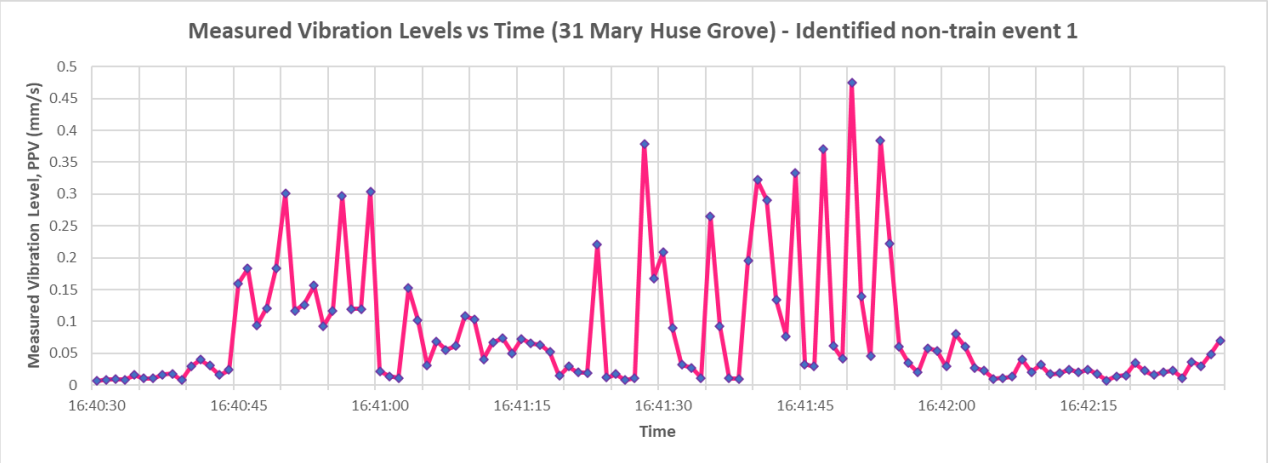

Figure 4: Measured vibration levels on 6 March between 4:40:30 pm and 4:42:30 pm

Figure 5 shows the highest PPV measured at 1-second intervals around the time of non-train event 2. The profile of the data shows a short-duration impulsive event. This is not consistent with the vibration profiles associated with either a train pass or use of a vibratory roller.

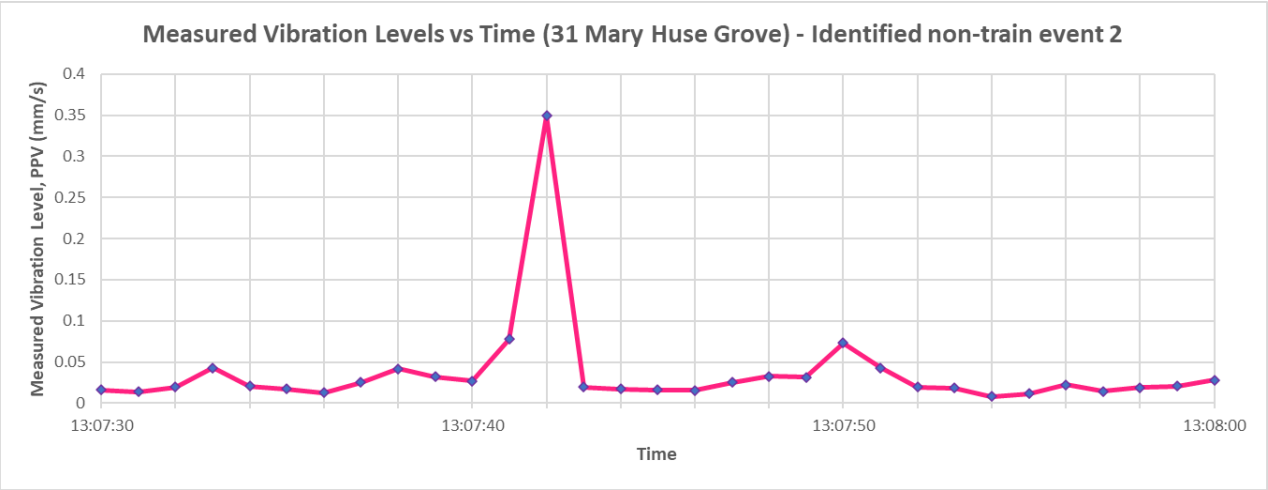

Figure 5: Measured vibration levels on 7 March between 1:07:30 pm and 1:08:00 pm

APPENDIX A GLOSSARY OF TERMINOLOGY

Noise	A subjective term used to describe sound that is unwanted by, or distracting to, the receiver.
A-weighting	A set of frequency-dependent sound level adjustments that are used to better represent how humans hear sounds. Humans are less sensitive to low and very high frequency sounds. Sound levels using an "A" frequency weighting are expressed as dB L_A. Alternative ways of expressing A-weighted decibels are dBA or dB(A).
dB	Decibel. The unit of sound level.
L_{Aeq}	The equivalent continuous A-weighted sound level. Commonly referred to as the average sound level and is measured in dB. Often included with a period over which the sound level was averaged i.e. $L_{Aeq(15mins)}$.
L_{Amax}	The A-weighted maximum sound level. The highest sound level which occurs during the measurement period. Usually measured with a fast time–weighting i.e. L_{AFmax}.
L_{AF}	The A-weighted sound pressure level measured with a fast time-weighting.
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 the vertical direction (up and down vibration), the horizontal transverse direction (side to side) and the horizontal longitudinal direction (front to back).
PPV	Peak Particle Velocity. The measure of the vibration amplitude, from zero to maximum. Used for building structural damage assessment.

APPENDIX B NOISE AND VIBRATION LOGGER SUMMARIES

NOISE LOGGERS

Two outdoor noise loggers have been installed within the properties of nearby residential receivers on Mary Huse Grove.

- 31 Mary Huse Grove – Located on ground level in the backyard. Line-of-sight from this logger to the work site is blocked by the railway bunding which runs adjacent to the property.
- 39 Mary Huse Grove – Located on the first floor balcony. This elevated position is more exposed to noise from the work site, as well as traffic noise from vehicles on State Highway 2.

Further detail regarding the locations and functionality of the noise loggers can be found in document reference '*Mm 01 r01 20241413 SA (Te Karearea – Noise Monitoring Protocol)*'.

Notes for presented results

Figure 1 and Figure 2 include + 3dB adjustments to allow for comparison with the noise limits (refer Appendix C for details). The green line in each figure denotes the L_{Aeq} 70 dB project limit.

L_{Aeq} noise values are for 15 minute periods (i.e. $L_{Aeq(15min)}$). We note that the noise limits do not specify a time period over which L_{Aeq} values must be averaged over. NZS 6803:1999 states that 15 minutes is often adequate.

The noise loggers capture the cumulative noise level of all sound sources in the area. This includes noise from construction activities, vehicles on the state highway, trains on the Hutt Valley line, etc. It is not possible to isolate noise from construction activities from these other sound sources. However, if the cumulative noise level is less than L_{Aeq} 70 dB, then construction noise levels alone are less than L_{Aeq} 70 dB.

We note that the noise levels measured at the 39 Mary Huse Grove are generally higher than at 31 Mary Huse Grove due to the logger's elevated and more exposed location. The noise levels measured at this logger have less variance, likely due to being more exposed to noise from vehicles on State Highway 2.

If required, we can provide analysis for specific events within the logging period, as we have done previously (document reference *Wr 01 20241413 HZ (Weekly Noise Monitoring Report (9 Jan to 15 Jan 2025))*.

VIBRATION LOGGER

One indoor vibration logger has been installed within 31 Mary Huse Grove. It is located in the room closest to the work site, and on the building foundations.

The logger measures the peak particle velocity (PPV) in mm/s per 1-second period in three orthogonal axes. PPV is the typical metric used to measure levels of vibration.

Notes for presented results

The green line in Figure 3 denotes the 0.3 mm/s PPV trigger level (refer Appendix D for details).

The highest PPVs out of each axis per period have been presented.

The PPV values presented for the week-long data are for 30 second periods. Where we have investigated non-train events, the PPV values presented are for 1 second periods.

The vibration logger captures the cumulative vibration level of all vibration sources in the area. This includes vibration from construction activities, trains on the Hutt Valley Line, residential activities, etc.

If required, we can provide analysis for specific events within the logging period (if we have not already provided this).

APPENDIX C RELEVANT NOISE RULES AND LIMITS

We understand that the conditions of consent within the Project's Resource Consent do not include specific noise limits for construction activities. Therefore, noise arising from construction activities must comply with the relevant rules under the Operative City of Lower Hutt District Plan ('the Plan').

Rule 14C 2.1(f) of the Plan requires that construction noise is to be assessed in accordance with New Zealand Standard NZS 6803P:1984. However, best practice is to apply the 1999 (most recent) version of this standard – New Zealand Standard NZS 6803:1999 "*Acoustics – Construction Noise*" ('NZS 6803:1999). This is common for consent applications in Lower Hutt. We note that the applicable limits in the 1999 version of the standard are slightly more stringent than in the 1984 version.

The applicable noise limits for the project works in Table 1 have been reproduced from NZS 6803:1999. The outlined periods are the noise limits applicable during the assumed working hours.

Table 1: Construction noise limits for activities sensitive to noise (e.g. occupied dwellings)

Time of Week	Time Period	Noise Limit for Long-Term Duration Works[1]	
		dB L_{Aeq}	dB L_{AFmax}
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 apply at 1 metre outside the façades of buildings, and only while they are occupied. As both noise loggers have been placed in free-field conditions, a +3 dB adjustment to all measured L_{Aeq} noise levels has been made prior to comparison with the noise limits, as per NZS 6803:1999.

[1] Construction work at any one location with a duration exceeding 20 weeks

APPENDIX D VIBRATION PERFORMANCE STANDARDS

There are no consent conditions which relate to vibration. Under the Plan, there are no specific limits for vibration generated by construction activities, only that "*all activities that cause vibration shall be carried out in such a manner that no vibration is discernible beyond the site boundary*".

British Standard BS 5228-2:2009 "*Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration*" provides guidance on the amenity effects of vibration resulting from construction activities. We often refer to the standard when managing the effects of construction noise and vibration. The standard includes descriptions which could be used as a guide for defining "discernible". The values in BS 5228-2:2009 are more often used as trigger levels for consultation as part of the vibration management plan rather than limits.

The descriptions in BS 5228-2:2009 are reproduced below:

- 0.14 mm/s PPV Just perceptible in particularly sensitive environments
- 0.3 mm/s PPV Just perceptible in normal residential environments
- 1 mm/s PPV Typically acceptable with prior notification
- 10 mm/s PPV Likely to be intolerable for any more than a very brief period

For the summary of our measurements, we have applied 0.3 mm/s PPV to be the trigger level for perceptible vibrations, applicable to 31 Mary Huse Grove. Any measured vibration greater than this level, and during the site working hours, warrants examination if complaints have occurred.