MEMO

MARSHALL DAY Acoustics

Project:	Glen Isla Protection Society - Coastal Protection Project	**Document No.:**	Mm 001 r01		
To:	Allan Fraser	**Date:**	12 July 2024		
Attention:	Allan Fraser	**Cross Reference:**			
Delivery:	Email	**Project No.:**	20240399		
From:	Ayla Wesley	**No. Pages:**	3	**Attachments:**	Yes
CC:	Luke Faithfull				
Subject:	Noise and vibration trial summary				

Summary

We have measured noise and vibration levels from a trial of rock dropping and general construction activities near Glen Isla Place, Waihi Beach. The trial was to simulate the worst-case noise and vibration levels during the proposed construction of a rock revetment along the Glen Isla Place beachfront properties.

Our measurements indicate the revetment works will comply with the relevant noise and vibration limits in the Western Bay of Plenty (WBOP) Operative District Plan (District Plan).

Section 4C.1.3 of the WBOP District Plan sets out the noise and vibration limits

The District Plan outlines the noise and vibration limits.

In Section 4C.1.3.1, the District Plan states that *'construction noise shall not exceed the noise limits in, and shall be measured and assessed in accordance with the requirements of NZS 6803:1999 – Construction Noise'*.

Table 2 – *'Recommended upper limits for construction noise received in residential zones and dwellings in rural areas'* says that the L_{Aeq} and L_{AFmax} upper limits are 75dB and 90dB respectively, for work carried out between 7:30am and 6:00pm on weekdays.

While the District Plan does not contain vibration limits[1], we have adopted German Standard DIN 4150-3:2016, taking a conservative approach to avoiding cosmetic building damage. The limits for short term (transient) events like a rock drop are:

- 5 mm/s peak particle velocity (PPV) for frequencies between 0 – 10 Hz
- 5 – 15 mm/s PPV for frequencies between 10 – 50Hz
- 15-20mm/s for frequencies ranging from 50 – 100Hz

This means that the limit will change depending on the frequencies generated by the rock drop. The most stringent limit is 5 mm/s PPV and this is the limit we have applied to the trial.

During the trial we measured at distances relevant to the actual revetment works

During the trial, we carried out noise and vibration measurements of a rock drop and general equipment movement on 9 July 2024 from 9:50 to 10:05 am. The weather was overcast (6 okta) with calm winds of approximately 0-1 m/s. The temperature was mild, at around 13°C.

[1] Noise and vibration, Section 4C.1 of the District Plan – The Explanatory Statement identifies that *'Vibration from activities has not been an issue in the District. In many cases Council can manage vibration effects through the management of noise emissions or through the provisions of the Health Act. Specific standards to manage vibration are therefore not proposed.'*

We used two Instantel vibration monitors (a Minimate unit with two geophones and a Micromate with a single geophone), an NTi XL3 sound level meter and a 01 dB Cube noise monitor. All instrumentation had valid calibration certificates, microphones were field-calibrated on site, and geophones were checked for level and weighted down with 5kg rice bags.

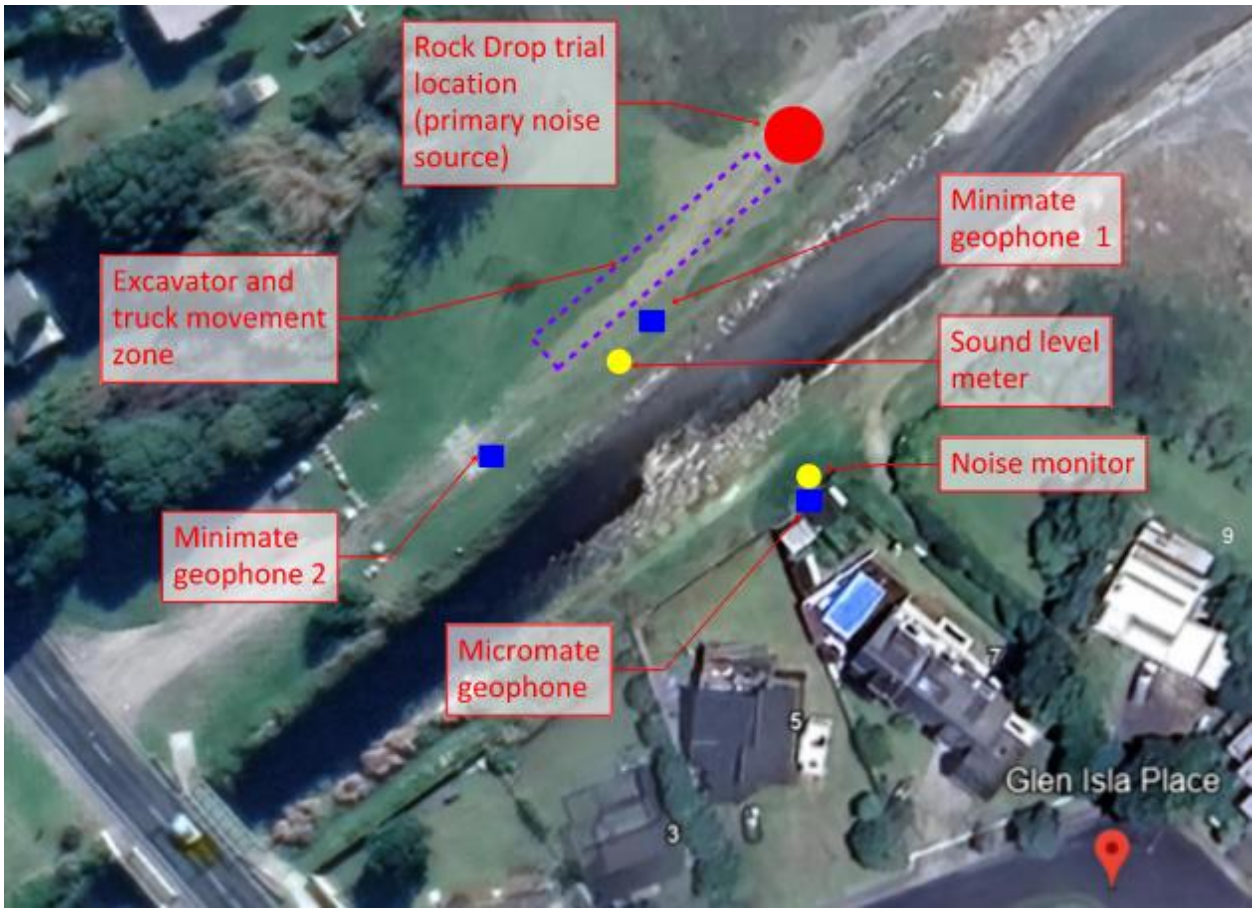
Beach Contractors Ltd operated the equipment they will use for construction activities associated with the proposed rock revetment structure and we measured it at relevant distances. The rock drop trial involved a tractor-trailer unit with several large rocks, tipping them onto the sand. The general equipment movement involved a 24t excavator (Hyundai 235 LCR-9) tracking back and forth. We measured this because we understand it was the subject of vibration damage complaints in the past.

We set up the Minimate vibration monitor with its geophones at 35m and 65m from where the rock drop took place. We also positioned the sound level meter at 35 metres. These positions match the distances the dwellings at 9 and 7 Glen Isla Place will be from the proposed revetment works.

We placed the Micromate vibration monitor in the ground just next to the boundary of 7 Glen Isla Place, and the noise monitor at 1 metre from the shed on that property. These units measured all trial activities, but the general equipment movement was most relevant based on historical issues.

Figure 1 shows an aerial photo of the trial area, with monitor locations and addresses.

Figure 1: Aerial photo showing trial area



The results indicate that noise and vibration levels during the revetment works will comply

Noise

During the rock drop, we measured noise levels of 72dB L_{Aeq} and 88 dB L_{AFmax} at 35 metres. These levels comply with the District Plan noise limits.

Appendix A shows the noise monitor data we captured at the 7 Glen Isla Place boundary (including 2.5 dB façade reflection off the shed). This shows 73 dB L_{Aeq} during the rock drop, and 60 dB L_{Aeq} during the other general works.

Note that we measured just the rock drop operation, which occurred for 45 seconds (from when the trailer started tipping to when the last rock hit the ground). This will be the noisiest part of the revetment works, but will only occur from time to time. Based on the other activities we measured during the trial (excavator works and general movement) we expect the average 15 minute noise level (specified by NZS 6803:1999) will be around 63 dB $L_{Aeq,15m}$. This readily complies with the 75 dB L_{Aeq} limit.

We were asked to predict the L_{Aeq} noise level at 20 metres (in case rock placement is needed closer than 35 metres). We estimate it would be 68 dB $L_{Aeq,15m}$, which also complies with the limits.

Vibration

During the rock drop, we measured vibration levels of 0.7 mm/s PPV and 0.6 mm/s PPV at 35 and 65 metres respectively. These values readily comply with the most stringent restrictions being the 5 mm/s PPV limit at 9 and 7 Glen Isla Place. We note that our measurements were on the ground, and as vibration transfers from the ground into a building structure, it loses energy. This means that any actual vibration levels on dwelling foundations themselves would be less than the recorded measurement.

The other activities (excavator works and general movement) generated around 0.2 – 0.4 mm/s PPV at the 7 Glen Isla Place boundary, which again readily complies with the limit. The rock drop generated 0.45 mm/s PPV (see circled area on the graph).

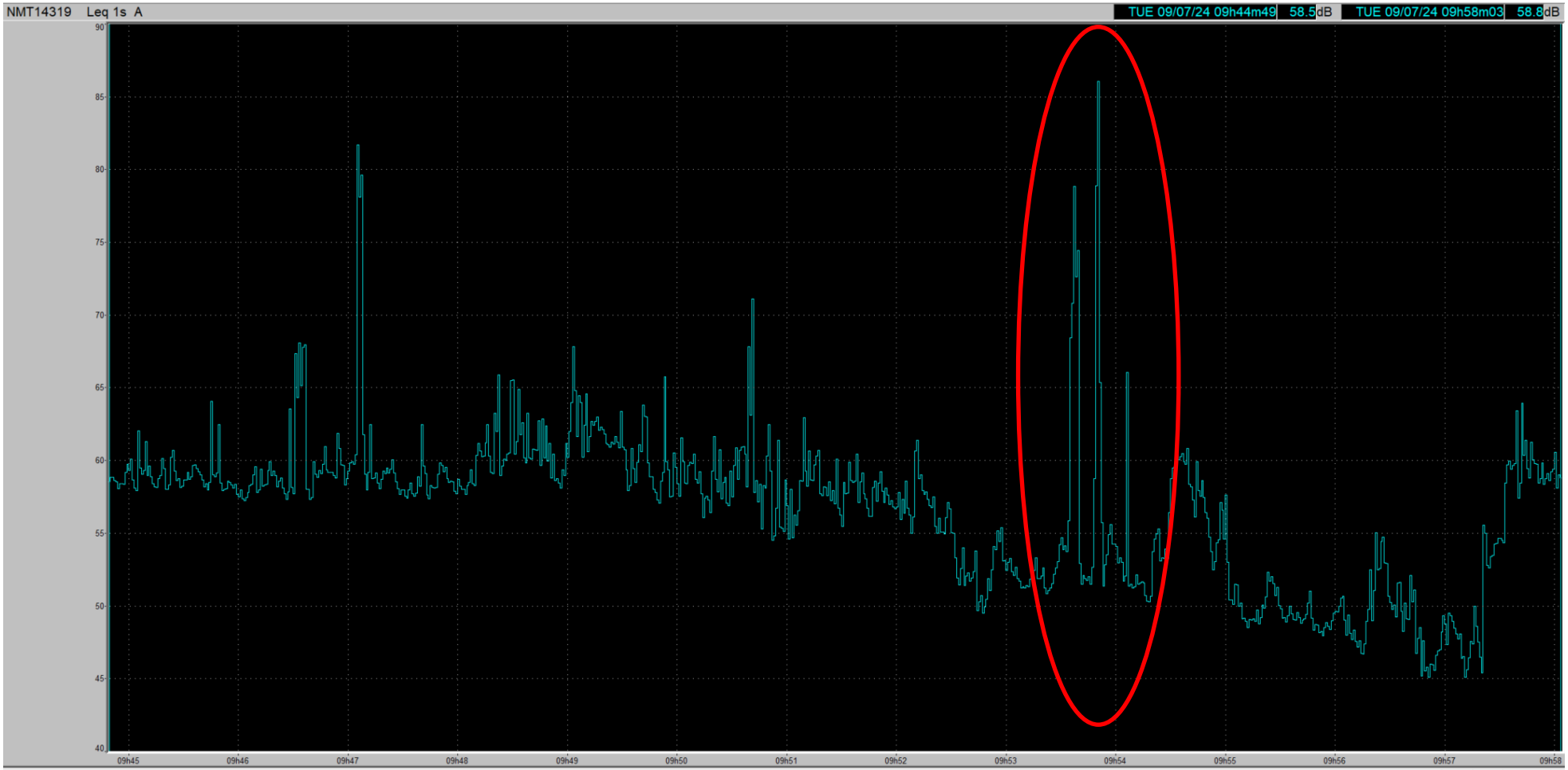
We also measured a peak of 0.66 mm/s PPV before the machinery mobilised. This was likely due to a neighbourhood dog that was running around the monitoring area, before we vacated for the measurements.

The graphs in Appendix B show our measured vibration levels, with the rock drop event indicated.

We were asked to predict the vibration level at 20 metres (in case rock placement is needed closer than 35 metres). We estimate it would be 0.9 mm/s PPV which also complies with the limits.

Appendix A – Noise data

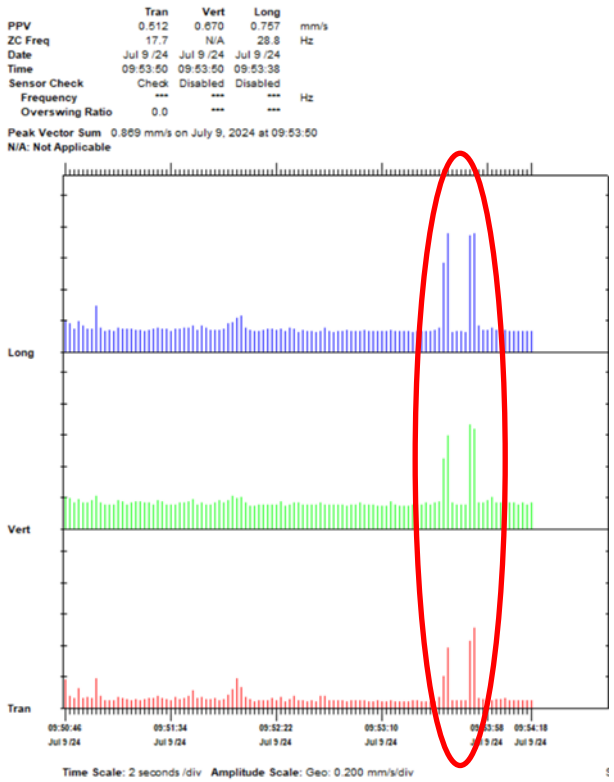
L_{Aeq} noise level measured at 7 Glen Isla Place (rock drop circled in red)

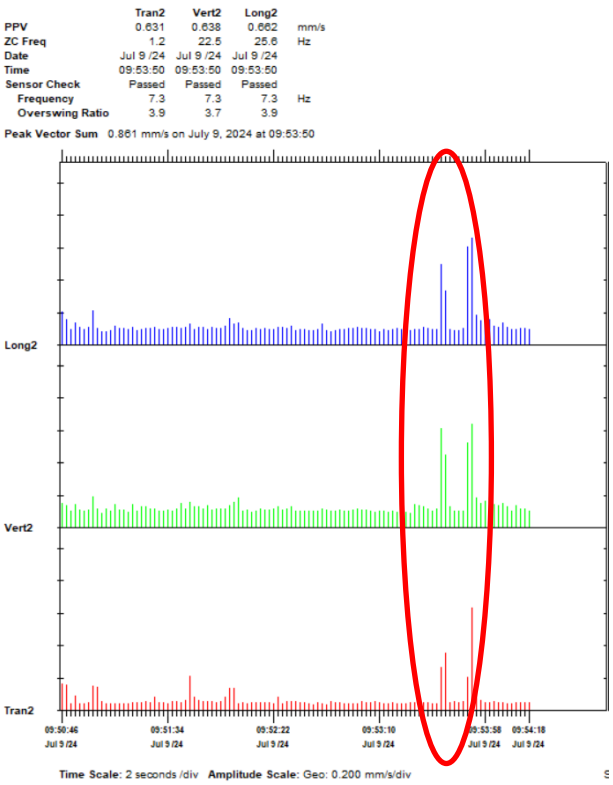


ISO 9001

Appendix B – Vibration data

Minimate vibration monitor one and two (rock drop circled in red)





Micromate vibration monitor (rock drop circled in red)