Styles Group
Acoustics & Vibration Consultants

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Kasey Zhai
B&A

By email: Kasey.Z@barker.co.nz

Dear Kasey,

PPC Request- 167-169 Pilkington Road – Clause 23 (2) noise requests

Auckland Council have issued a second Clause 23 request (the **Request**) seeking empirical rail noise and vibration measurements for the proposed plan change site at 167-173 Pilkington Road (the **Site**).

We were unable to obtain measurements of rail activity in 2023 as the Eastern Line was closed. The Eastern Line resumed operation in early January 2024.

This advice sets out the results of the rail noise and vibration monitoring conducted on the Site between 7 February 2024 and 23 February 2024 and our recommendations.

1.0 Monitoring equipment and methodology

1.1 Rail vibration measurements

Vibration measurements were obtained over a 7-day period from 8 February 2024 using a Texcel ground vibration monitor and geophone. The instrument was located on the Site approximately 12m from the track in the locations shown in Figure 1 and Figure 3. The instrument was set to log PPV, PVS, RMS and average values in all axes in contiguous 5 second samples.

The geophone was coupled to a concrete-encased column used to support the lightweight roof over a loading dock. The geophone was coupled using a solid timber block that was securely clamped to the concrete at a height of approximately 100mm above the ground. The geophone was located close to both the rail line and the main loading dock area which was frequented by trucks and forklifts throughout the day – many within 1m of the instrument. Our assessment of the data has concentrated on the vibration events occurring at night time when the loading dock is not in use. The vibration event data for freight train pass-bys coincides with the audio recordings from our noise measurements.

The data produced by this instrument is not strictly comparable with the 0.3mm/s vw95[1] criteria recommended in the KiwiRail Policy[2] but it remains useful to demonstrate the general nature of the vibration levels on the site.

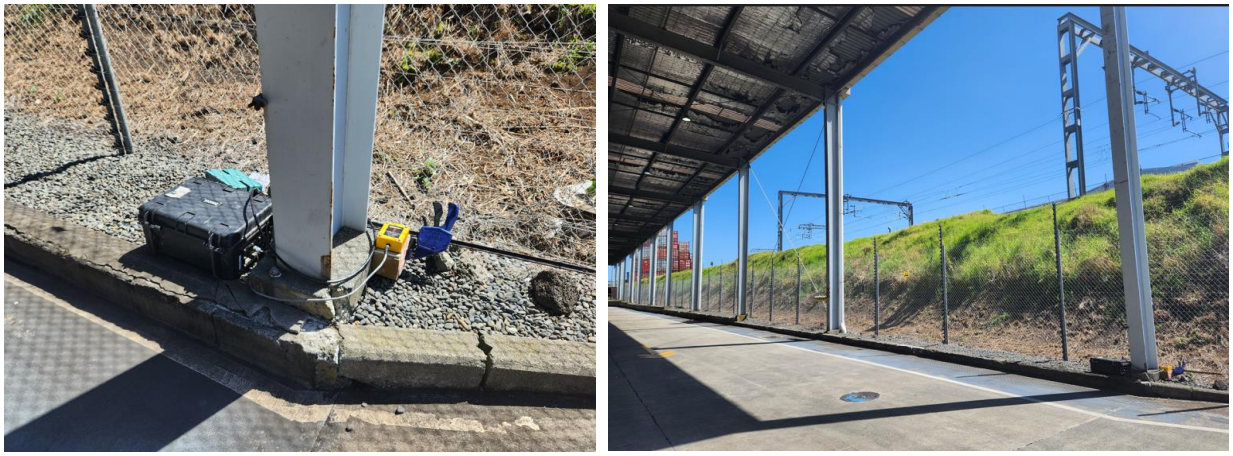

Figure 1 Seismograph on the Site

1.2 Noise measurements

Styles Group deployed a sound level meter on the Site from 7 February to 23 February. The instrumentation comprised a 01dB Cube logger with an outdoor microphone kit, sound recording, 1/3rd octave band recording and logging in one second intervals, meeting IEC651 Type 1 accuracy criteria. The sound level meter was deployed 5m from the building facade at a height of 5m from the ground. Figures 2 and 3 displays the measurement setup and location. All measurement and assessment of the data has been undertaken in accordance with the relevant sections of NZS6801:2008 and NZS6802:2008.

Figure 2 Sound level meter on Site

[1] See our original Assessment of Noise and Vibration effects lodged with the Plan Change request

[2] All Styles Group equipment capable of producing data for direct comparison with the vw95 criteria was deployed on other sites over the period that the second Clause 23 request was provided to us and when our response was required.

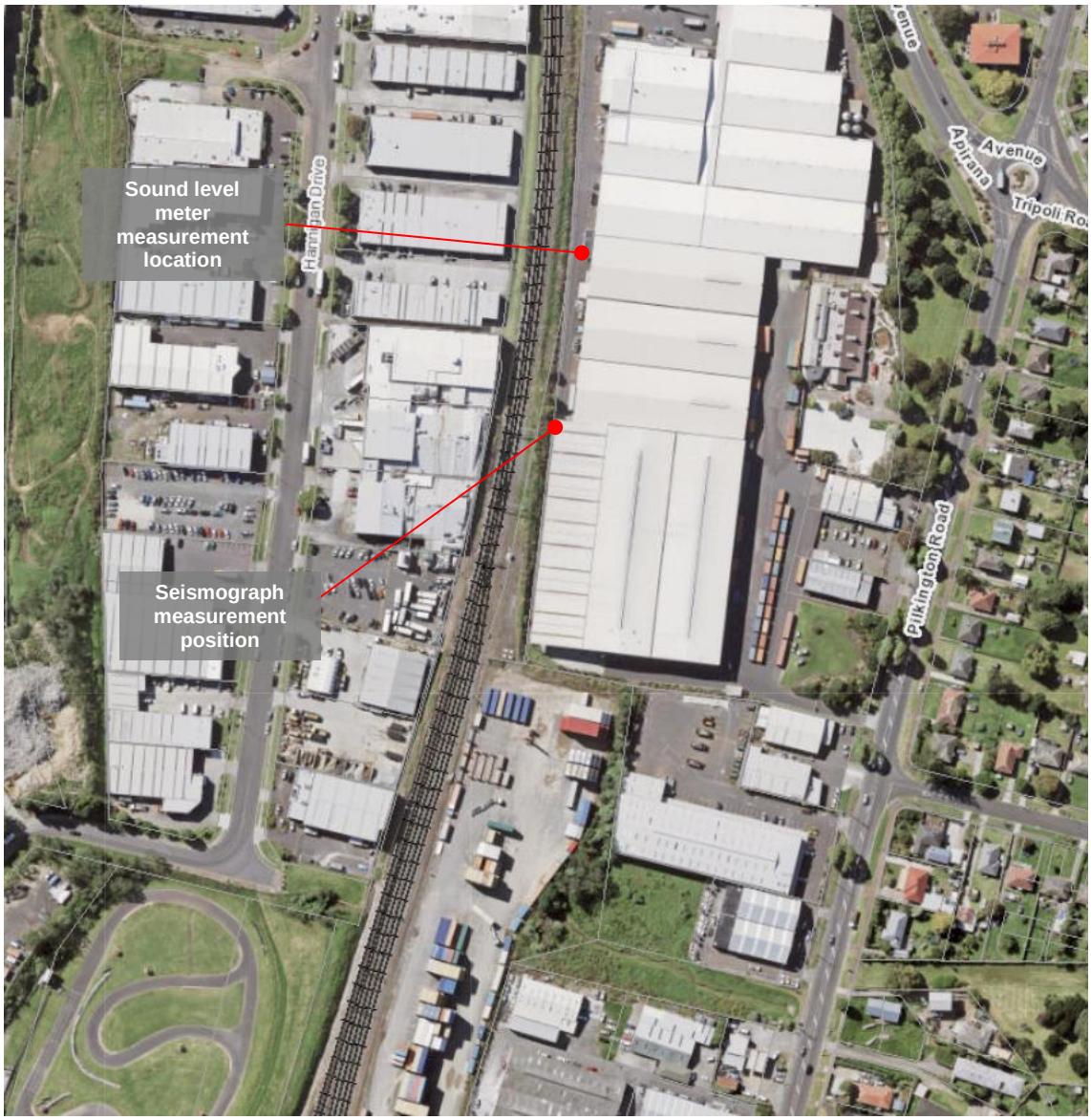

Figure 3 Measurement positions on the Site

2.0 Measurement results

2.1 Rail Vibration

The instrument recorded a significant number of freight train pass-bys for analysis. The vibration levels were variable between pass-bys, but typically ranged between 0.3mm/s PPV and 0.5mm/s PPV. These events are likely to be just perceptible to a person. The RMS velocities for comparison with the 0.3mm/s vw95 criteria are likely to be at least 3-4 times lower than the measured PPV values based on our experience of rail vibration elsewhere in Auckland and New Zealand. We expect that the weighted RMS velocity for a single pass-by is likely to be less than 0.2mm/s when measured on the existing lightweight footings.

Our observations of passenger train pass-bys is that any vibration generated is imperceptible at the boundary on the concrete surface of the loading dock.

We consider that the significant additional mass of the buildings that are likely to be developed will reduce the vibration levels further. We expect that full compliance with a level of 0.3mm/s vw95 will be readily achievable in the future development.

2.2 Rail Noise

We measured over 60 freight train pass-by events during the measurement period. The Sound Exposure Level (**SEL**) for the loudest 6 freight pass-by events ranged from 96.7dBA to 100.5dBA, with a logarithmic average of 99.6dBA.

An SEL of 99.6 dBA equates to 67 dB $L_{Aeq(1hr)}$ for two freight train pass-by events in a one-hour period[3] at the measurement position 15m from the track. This level increases to 68dB $L_{Aeq(1hr)}$ when adjusted to be 12m from the rail line. This is 2dB lower than the level of 70dB $L_{Aeq(1hr)}$ at 12m for two freight trains per hour that KiwiRail adopt in their Policy.

We measured a significant number of passenger train pass-by events during the measurement period. The SELs for the loudest 6 passenger train pass-by events were 11dB quieter than the freight trains. This confirms that the freight train pass-bys should form the basis of the precinct controls and building designs.

3.0 Recommendations based on rail noise and vibration measurements

3.1 Do the rail vibration measurements change our recommendations?

Our Assessment did not recommend any precinct standards to manage rail vibration inside buildings on the site. Our analysis of the preliminary building designs, shape and mass and the separation distance from the Eastern Line was that the vibration levels in ASN are likely to be no greater than the 0.3mm/s vw95 criterion without any specific design treatments

KiwiRail's Policy recommends that any new or altered buildings used for a noise sensitive activity that are located within 60m of the boundary of a railway network are designed and constructed to achieve rail vibration levels not exceeding 0.3mm/s vw95. Our Assessment notes that KiwiRail's request for vibration controls are not routinely adopted in plan reviews. Many recent plan changes have resulted in a vibration alert area rather than a rail vibration standard.

The measurement results demonstrate that the level of rail vibration received on the Site is low and we remain of the view that a level of 0.3mm/s vw95 will be readily achieved inside future buildings.

[3] Consistent with KiwiRail's guidelines for freight pass-bys

3.2 Do the rail noise measurements change our recommendations?

The measurements we have undertaken demonstrate that the rail noise from freight trains was 68 dB $L_{Aeq(1hour)}$ at 12m from the track during the measurement period.

Our Assessment recommends a precinct standard that adopts KiwiRail's guideline rail noise levels of 70 dB $L_{Aeq(1hour)}$ at 12m from the track for two freight train pass-bys per hour. This source level is routinely adopted and promoted by KiwiRail in their submissions to District Plan reviews, plan changes, Notice of Requirements and resource consent applications across New Zealand. KiwiRail's source level is designed to take into account the potential variability in noise levels from rail pass-by events.

Our Assessment noted that KiwiRail's source level was likely to be slightly conservative for this section of the track, however would be suitable for the Precinct Controls given the inherent variability in rail pass by events. Our measurement results confirm this finding, with the 2dB difference being very small.

The measurements we have undertaken are based on a snapshot in time and are useful to demonstrate that the noise levels from freight train pass-bys are no greater than KiwiRail's source levels. We consider that the adoption of KiwiRail's source level provides a sufficient margin of safety to allow for variance across the rolling stock. We do not recommend any change to our earlier recommendations for rail noise.

Please contact me if you require any further information.

Yours sincerely,

Jon Styles, MASNZ
Director and Principal