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File Ref: AC22417 – 01 – R1

28 July 2023

Rachel Cottam
Christchurch City Council
PO Box 73013
CHRISTCHURCH 8154

Email: Rachel.Cottam@ccc.govt.nz

Dear Rachel,

Re: RMA/2022/3611, 320A Cumnor Terrace – Review of noise assessment

We understand that Christchurch City Council (CCC) require a peer review of a noise assessment provided in relation to the above resource consent. This noise assessment covers both current and proposed activities of the container yard operated by Pinnacle Group, a tenant on the subject site which is closest to residential properties.

Our review is based primarily on the following documents:

- Noise Assessment titled *320A Cumnor Tce Container Yard* Job Ref 221556 as prepared by Powell Fenwick (PFC) and dated the 5th of May 2023 (the Noise Assessment)
- Resource Consent Application as prepared by Novo Group and dated the 7th of December 2022 (the Application)
- Email from Tim Walsh with the subject *RE: RMA/2022/3611 - Request for further information 320A Cumnor Terrace* received on the 6th of July 2023 (the RFI email)
- Formal RFI response from Sam Jackson of PFC dated the 26th of July 2023 (the RFI memo).

As the Applicant and Council differ on the relevance of some RFI questions, and application of the specific permitted baseline arguments, some questions are addressed in the RFI email and some in the RFI memo.

We have also been provided with a summary of community complaints relating to current activities on the Applicants site, and copies of noise monitoring undertaken by Council on the 23rd of August 2022.

The author of this review also visited the area on the 18th of July 2023 and observed the current operation of the container yard from Long Street, Gould Crescent and public walkways alongside the Heathcote River.

1.0 SCOPE

In our review we have assumed that the land-use described in the Noise Assessment represents the activity likely to occur under the proposed Resource Consent. We have primarily discussed the noise effects from this activity in the following sections.

We are aware that the Noise Assessment only discusses noise from one of the tenants on the site and relates to daytime operation only. Since the District Plan noise limits apply cumulatively to a site, and not individual

tenants, this does create some uncertainty. However, given that the current / proposed activity is closest to the residential boundaries, it is likely to be the loudest daytime activity at these locations, and this was what we observed during our site visit. While we consider it reasonable to focus on this activity, we note that other tenants may, or may not contribute to cumulative noise levels and effects received from the subject site at residential properties. Specifically, we do not know whether there is much night-time activity on the other tenant sites.

Since the Application is for an activity which is compliant with the District Plan noise standards, this defines the outer envelope of the activity – and activities which are different in character, level of noise emission, or have more night-time contribution than the current / proposed activity could occur.

However, we note that the same noise limits apply at the boundary of residential sites (regardless of where the source is located) and we have commented on the protection provided by the District Plan limits in the sections below. For most environmental sources these limits represent a good level of protection against annoyance and sleep disturbance for noise received in a residential zone. However, general District Plan noise limits are by their nature broad in application, and compliance with Plan Standards is not the only factor to be considered when considering what constitutes a reasonable level of noise, as required under Section 16 of the RMA.

2.0 ACCEPTABLE NOISE LEVELS

2.1 At residential locations

The container yard is only proposed to operate between 0700 and 1800 hours. On this basis, the PFC report primarily focusses on compliance with the Christchurch District Plan daytime noise standard of 50 dB L_{Aeq}, although S16 of the RMA, and the World Health Organisation guidance are also discussed in section 2.

A 50 dB L_{Aeq} limit is a common threshold used for the protection of residential amenity in suburban areas and aligns with the thresholds discussed by the World Health Organisation (WHO) Guidelines for Community Noise to protect against moderate annoyance for the majority of people. A higher "upper-bound" guideline residential upper noise limit of 55 dB L_{Aeq} is discussed in both NZS 6802:2008 *Acoustics – Environmental noise* and the WHO guidelines.

Both NZS 6802:2008 and the WHO guidelines also discuss how annoyance from noise depends not only on the sound pressure level, but also other factors. NZS 6802 uses a rating level approach where the sound level is measured over a standard reference time of 15 minutes and adjusted to account for special character (up to +5 dB) and duration (up to -5 dB). On character, C6.3.1 of the standard notes that: *"The intrusiveness of a sound is not just a function of its sound pressure level. It is also affected by its character. Sound that has special audible characteristics, such as tonality or impulsiveness, is likely to cause adverse community response at lower sound levels, than sound without such characteristics."*

"Bangs or thumps" are examples of sound with impulsive character in CB4.1 of NZS 6802. While no objective method of determining impulsive events is given, our observation is that given the regularity of these type of events from container handling activity at the closest residential dwellings, this source could be considered impulsive.

However, while the District Plan references NZS 6802 for the assessment of noise, and therefore allows a duration adjustment (to adjust the sound level downward), it does not allow for a penalty for Special Audible Characteristics (SAC). Rule 6.1.4.1 (as reproduced in the PFC report, emphasis added) states that:

6.1.4.1 Measurement and assessment of noise

> *Unless otherwise specified elsewhere in this District Plan, noise shall be measured in accordance with NZS 6801:2008 "Acoustics – Measurement of environmental sound", and assessed in accordance with NZS 6802:2008 "Acoustics – Environmental noise",* ***except that provisions in NZS 6802 referring to Special Audible Characteristics shall not be applied***

This means that the District Plan standards are effectively more lenient in terms of the level of noise effect they would permit, for sources which have SAC, than they are for other more broadband environmental sources.

The amount of residual sound in the area (other sound present), is also relevant to the acceptability of noise in an environment. PFC have measured traffic noise levels at locations close to Tunnel Road, and then used modelling to determine the levels at locations more distant from the road. Levels of 55 dB L_{Aeq} are predicted at 44 Gould Crescent, reducing to 52 dB L_{Aeq} at 34 Gould Crescent, and 49 dB L_{Aeq} at 30 Long Street.

Limited detail has been provided on how this modelling has been undertaken, including (for example) whether screening from containers has been allowed for on the Applicants site. However, this exercise is still useful to illustrate that residential properties close to Tunnel Road may typically be exposed to noise levels higher than the District Plan limit of 50 dB L_{Aeq}. At properties more distant from, or screened from major roads, noise levels will be lower. A predicted level of 49 dB L_{Aeq} is provided for 30 Long Street and it is possible that noise levels further south along Long Street will be lower again. Subjectively, our impression was that the impulsive nature of noise from existing container yard operations often made it a distinctive part of the noise environment at residential locations removed from Tunnel Road.

In summary, the District Plan residential boundary limit of 50 dB L_{Aeq} is a typical level of protection for residential amenity for general environmental sources and appears to be broadly consistent with existing ambient noise levels in the area. However, since container handling contains an impulsive character, it is likely to cause adverse community response at lower levels than other types of noise. This would often be penalised by +5 dB under a NZS 6802 assessment, although in this case the District Plan, does not allow for this penalty to be applied, and is therefore more lenient on noise with these characteristics.

Relying solely only on District Plan compliance to confirm the acceptability of this type of noise therefore has some limitations. On the other hand, if noise levels assessed in complete accordance with NZS 6802 (including the SAC penalty omitted by the District Plan), comply with a limit of 50 dB L_{Aeq} at the residential zone boundaries, then we consider that noise from container handling will be at a reasonable threshold.

This would be generally consistent with the overarching S16 duty of occupiers of land to *"adopt the best practicable option to ensure that the emission of noise from that land… does not exceed a reasonable level"*. Given the level of noise generated by container impacts is inherently variable, but the level of noise from typical events can be reduced by drivers typically operating in a careful manner, with slower "touch downs" (and being trained accordingly to reduce the likelihood of louder events), procedures to ensure this is the case represent part of being a responsible operator, and the "best practicable option" in our opinion.

We also note that if noise levels are higher on infrequent occasions (for example every 2 – 3 months for a few hours due to a gap in the barrier), but noise levels remain below the upper residential amenity threshold of 55 dB L_{Aeq} as outlined in NZS 6802:2008, we do not consider this will be particularly problematic in terms of noise effects. Typical day-to-day levels from the site are more likely to be relevant to community annoyance.

On the night-time District Plan residential noise limits, we note that the 40 dB L_{Aeq} / 65 dB L_{AFmax} boundary thresholds are also a typical residential zone protection – and suitable to ensure sleep protection. As for the daytime limits, since the Plan does not allow for a SAC adjustment it provides less effective protection for sources with this character, than it does for noise of a more broadband character. However, even with an adjustment for SAC, noise levels would still remain below the 45 dB L_{Aeq} guideline outlined in the WHO guidance, for noise received at the facade of dwellings with windows ajar for ventilation. We note that if container handling on the site has previously occurred before 0700 hours as suggested by residents – the night-time L_{AFmax} limits could have been exceeded at residential dwellings – causing the potential for awakening events as described.

2.2 At open space zones

We agree with the PFC comments that noise levels in the Open Space Natural Zone on the opposite side of Tunnel Road will be elevated due to traffic noise during the daytime period and agree that an exceedance of the 55 dB $L_{Aeq\ (15\ min)}$ daytime limit is unlikely to be of significance in this location.

PFC have not commented on noise effects on walkway areas to the north of the site (within the Open Space Water and Margins Zone). Since these areas are likely to be transiently occupied by people moving through them, some are immediately behind proposed barriers, and noise emissions will be controlled by the nearby residential boundaries, we do not consider the level of likely exceedance in this zone to be of particular concern.

3.0 METHODOLOGY

PFC have measured noise from the existing activity on site both directly and at the closest residential sites.

Close-proximity measurements confirmed that noise levels from a container handler operating for extended periods near to the northern boundary of the yard, with minimal screening to residential dwellings, is likely to be 53 dB $L_{Aeq\ (15\ min)}$ at 34 Gould Crescent (and by extension at other sites a similar distance from the activity). During our site visit, there were two handlers operating in various locations. At times there was a handler operating in an unscreened location near the northern boundary of the yard which is similar to the situation described by PFC. It appears likely that similar noise levels would still be received at the closest residential properties. This would only represent a non-compliance with the District Plan limit if this type of activity, in this location, were to occur continuously over a day (since a duration adjustment of up to -5 dB is permitted when applying the District Plan limits if lower levels are received at other times of the day).

Mitigation is proposed, and PFC have modelled a layout which includes increased screening from container stacks along the site boundaries, and an additional 2.4-metre-high fence, atop the existing 2-metre-high bund on the northern river boundaries. They have also modelled a scenario with partial screening, which illustrates the likely level of non-compliance due to a gap in the containers (i.e. when boundary containers are removed and the stack re-built).

With the proposed mitigation (from both fence and container stacks), the predicted noise levels are 44 dB $L_{Aeq\ (15\ min)}$ at residential properties on Long Street, or 49 dB $L_{Aeq\ (15\ min)}$ without the fence. This is a reduction of 7 – 10 dB when compared to the unscreened / partially screened scenario described in section 5.2 and is consistent with the order of reduction we would expect from a continuous barrier in the configuration shown, blocking line of sight.

The layout diagrams provided in figure 3.1 (current) and figure 3.2 (proposed) of the Noise Assessment, show that in the proposed layout, activities will occur closer to the residential properties on Long Street than they have done previously. Because there is additional screening, it is not clear whether average and maximum noise levels will increase or decrease from what has previously been experienced at these dwellings.

PFC have assumed that container repair and cleaning activities will not contribute in a meaningful way to the overall site noise emissions given they are "inherently less noisy", set back from the site boundary, and carried out at ground level. Container repair work can involve grinding and hammering, which are not inherently quiet – but we generally agree that the movement of trucks and handlers is expected to be the largest contributor to noise received at neighbouring properties.

To better understand the methods and accuracy of the modelled results, we asked some questions about aspects of the PFC modelling which were unclear to us from the Noise Assessment. The RFI memo provides further insight on these matters, as follows:

- We agree that given the location, number and daytime only operation of refrigerated containers (and generator if required), discussed in the RFI memo, these will not contribute appreciably to daytime noise levels at residential boundaries.

- PFC note that the *"hoist operator had influence over the maximum instantaneous noise that was generated when a container was stacked onto another container"* but that this had limited impact on the time averaged noise levels, due to the contribution from engine and exhaust. The variation in noise levels with operator behaviour, matches resident comments and our previous experience with container handling noise. We agree that the influence of typical maximum container impact events will have little influence on the L_{Aeq} level and therefore the predicted levels in the Noise

Assessment. However, as discussed above, we consider that this impulsive character is relevant to an assessment of noise effects and consider the addition of a penalty to account for this important when determining the acceptability of this noise.

- As mentioned by PFC, we note that a slow and controlled touch-down between objects (spreader onto container, container onto container, container onto ground) is important to control maximum noise emissions from container handling sources. Good training and operating procedures (perhaps contained within a Noise Management Plan) would be required to ensure this happens consistently on a day-to-day basis. In our opinion, the physical screening proposed will not represent a "best practicable" mitigation option by itself – and these management measures are also important.

- PFC have provided some further detail on maximum (L_{AFmax}) noise levels measured at residential boundaries across the Heathcote River, noting that when they measured a mixture of screened and unscreened impacts, maximum noise levels were found to be between 55 – 65 dB L_{AFmax}. In our opinion, this helps confirm our subjective observations that impulsive events are a regular feature of noise from this site, and the regularity of impulsive events makes this noise particularly distinctive. We note that resident complaints about sleep disturbance indicate that it is likely that maximum noise levels have previously been higher than 65 dB L_{AFmax}.

- An updated contour with predictions down to 45 dB L_{Aeq} has been provided, along with clarification that no screening to the southwest is proposed. This contour appears to show some properties on Gould Crescent receiving noise levels of 45 dB L_{Aeq} or higher (with full screening, perhaps due to façade reflection). This is with handlers operating some distance from this location. Since the predicted noise level in the Noise Assessment for this scenario is up to 44 dB L_{Aeq} this indicates that the highest noise levels may not always be received at locations closest to the handler activity, and there could be some small variation in the predicted results from hoists operating in locations that differ from those modelled.

- The gap between containers has been modelled as 1 metre, and a sensitivity test undertaken over a smaller area to confirm that a smaller grid size in the model (0.5 m) only results in small changes in the model results (<1 dB). This is a reasonable approach. It has also been confirmed that the larger gap in the barrier at the north-east corner is required for access. We note that this may mean that the residential property at 54 Gould Crescent is more regularly exposed to noise levels which are closer to the level of 53 dB L_{Aeq} predicted with a "gap" present in the barrier. However, this property will be exposed to traffic noise levels that are also elevated, given proximity to Tunnel Road – and so the noise effects of these higher levels are less likely to be problematic at this location.

- PFC have confirmed that the effects of the screening will not diminish as handlers operate more centrally on the site, given any reduction will be offset by the increased distance from receivers. This conclusion appears reasonable.

- PFC have used two different methods to test the effect that reflections from other containers in the yard may have on predicted levels. On this basis PFC conclude that this that noise levels accounting for reflections are within 1 dB of calculated results with no reflections, and we agree this is likely to be the case.

The responses above confirm that the PFC modelling has been conducted in a reasonable manner, and we consider it suitable to demonstrate that compliance with the District Plan standards can typically be achieved with the mitigation proposed. Some of the PFC responses reflect the uncertainty inherent in the predictions (for example the higher levels shown in the contour for Gould Crescent, and effect of reflections). PFC note this in their own report, referring to a *"typical modelling error of ± 3 dB"*. The discussion in section 6.2 of the Noise Assessment is also helpful, as it confirms that the modelling aligns well with measurements of the existing container yard activity at key residential locations.

4.0 PREDICTED NOISE LEVELS

As noted in section 3, the Noise Assessment outlines a predicted noise level of 44 dB L_{Aeq} at the closest residential boundaries due to typical operation of the site, with both a container screen and fence. However, as discussed above, the contour provided in the RFI memo indicates that some locations may receive in the order of 45 dB L_{Aeq}.

This prediction does not appear to include any duration adjustment. If operating hours are typically between 0700 – 1800 hours as stated, a duration adjustment of at least -1 dB would likely apply (using the daytime hours of 0700 – 2200 outlined in the District Plan). With a +5 dB adjustment to account for SAC, the rating noise level assessed in accordance with NZS 6802 would be 49 dB L_{Aeq}. This meets our proposed threshold of acceptability for residential locations described in section 2.0. While there may be some small uncertainty in the modelling results, we consider this adequately demonstrates that a reasonable noise level can be achieved with the proposed mitigation.

A section of the container barrier will be removed on occasion to retrieve long term containers from storage. The Noise Assessment notes that this will occur once every 2 – 3 months, and the gap will only be present for 1 – 2 hours. Noise levels are predicted to be 54 dB L_{Aeq} at residential boundaries in this scenario (with no duration or SAC adjustment). As a duration adjustment of -5 dB, and a SAC adjustment of +5 dB is likely to apply, this level is predicted to remain below the upper residential amenity threshold of 55 dB L_{Aeq}. If this event occurs as infrequently as proposed, this is unlikely to be problematic. As discussed in section 3, due to the gap in the north-east corner of the container barrier, similar levels may be received more regularly at 54 Gould Crescent although this property is exposed to higher traffic noise levels from Tunnel Road.

Based on the above, it does appear likely that with the mitigation proposed, noise from typical operation of the facility can comply with the both the District Plan daytime noise limit, and our proposed threshold for 'reasonable noise' (which includes an additional +5 dB penalty for SAC). As outlined above, we consider that along with meeting any proposed limits, there should be a requirement for the operator to adopt management procedures (for example driver training on slow touch-down procedures), to reduce the likelihood of individual higher noise events from the site. In our opinion, this would be consistent with the S16 duty to adopt the best practicable option to reduce noise from the site. These measures could be captured in a Noise Management Plan.

5.0 SECONDARY MATTERS

We have reviewed a summary of resident concerns regarding the activity proposed / operating on the subject site. These provide a helpful insight into how residents perceive noise that has previously occurred on the site. We are aware that some comments appear to relate to operation in a manner that is not consistent with the proposal (for example, earlier starting hours and with handlers operating unscreened to residential dwellings).

While general noise emissions are discussed in the earlier sections of this report, the resident summary raises some items which were not discussed in the Noise Assessment, and so we have provided a commentary (and discussion of the PFC response where relevant) below:

Resident concerns included mention of vibration with residents noting that *"When the movement of containers occurs, vibrations have been felt by multiple residential properties. It has been reported that the movements feel like houses are shaking and is similar to earthquakes"*. In the RFI email, PFC comment has been reproduced, which notes that "*low frequency sound waves have the potential to rattle glazing in older houses, and that it is highly unlikely that vibrations from container placement would carry that distance through the ground."*

No objective assessment has been undertaken to confirm this, and if perceptible vibration (or rattling of glazing from low frequency sound waves) is a regular occurrence due to activity on the site – this could exacerbate perceived noise effects. We are not convinced following our site visit that vibration levels are below the threshold of perceptibility on the opposite side of the river. While vibration levels are difficult to predict, as they are site specific and particularly dependant on ground conditions, we are aware of data

relating to port activity which confirm that it is plausible that vibration levels from some events could exceed a typical residential environment threshold of perceptibility (0.3 mm/s PPV from BS 5228-2:2009) at the distances involved. Suitable management procedures to ensure that drivers are adopting slow touch-down procedures would also be an appropriate mitigation to reduce this effect.

Resident complaints also refer to high levels of noise / vibration from container drops from height, and containers being blown over by the wind which appears to have occurred on occasion. While these types of event would undoubtedly generate very high levels of noise and vibration, we expect they would occur rarely as they are also undesirable for the operator, and should be given less weight than day-to-day noise from the activity.

Concerns have also been raised by residents that the containers reflect noise from Tunnel and Ferry Roads back towards the residential properties, and that this has become "significantly more noticeable" since container barriers have been constructed. PFC comment has been provided in the RFI email, noting the difference between the proposal and a permitted scenario, is likely only very slight. No comment about the absolute change has been provided, although we expect this would be less than 3 dB. Changes in character may also be evident, as some frequencies would be reflected more efficiently by a barrier. Again, this type of secondary effect has the potential to exacerbate noise effects perceived by residents.

The potential for these secondary matters to have an influence on noise effects has been considered when determining the reasonable noise threshold discussed above.

Sleep disturbance for young children during the daytime has been raised as a concern by residents. I note that the underlying District Plan limits do not provide any specific protection for sleep during the daytime, and this would be unusual due to the restrictions it would place on typical activities.

6.0 CONCLUSIONS

Our review focusses on the Noise Assessment for the current / proposed container yard activities on the closest portion of the subject site, as the activity most likely to occur if the proposed Resource Consent is granted.

Since the Application is for an activity which is compliant with the District Plan noise standards, this defines the outer envelope of the activity – and activities which are different in character, level of noise emission, or have more night-time contribution than the current / proposed activity could occur. Activities due to other tenant activity on the subject site could also contribute cumulatively to overall noise emissions.

We expect that for most noise sources likely to be present in an Industrial General zone, the general District Plan residential zone limits would ensure a reasonable level of protection for residential activity is obtained. The District Plan residential boundary daytime limit of 50 dB L_{Aeq} is a typical level of protection for residential amenity for general environmental sources and appears to be broadly consistent with existing ambient noise levels in the area. The 40 dB L_{Aeq} / 65 dB L_{AFmax} night-time boundary thresholds are also a typical residential zone protection – and suitable to ensure sleep protection.

However, since container handling contains an impulsive character, it is likely to cause adverse community response at lower levels than other types of noise. This would often be penalised by +5 dB under a NZS 6802 assessment, although in this case the District Plan, does not allow for this penalty to be applied, and is therefore more lenient on noise with these characteristics.

Relying only on District Plan compliance to confirm the acceptability of this type of noise therefore has some limitations. Whereas, if noise levels assessed in complete accordance with NZS 6802 (including the SAC penalty omitted by the District Plan), comply with a limit of 50 dB L_{Aeq} at the residential zone boundaries, we consider that noise effects are likely to be acceptable, and at a reasonable level.

We also note that if noise levels are higher on infrequent occasions (for example every 2 – 3 months for a few hours due to a gap in the barrier), but noise levels remain below the upper residential amenity threshold of 55 dB L_{Aeq} as outlined in NZS 6802:2008, we do not consider this will be particularly problematic in terms

of noise effects. Typical day-to-day levels from the site are more likely to be relevant to community annoyance. We note due to the gap in the north-east corner of the container barrier, higher levels may be received more regularly at 54 Gould Crescent although this property is exposed to higher traffic noise levels from Tunnel Road.

We also do not expect that the higher noise levels predicted in open space zones, will be of particular concern, given the transient use of these areas, traffic noise received at locations near Tunnel Road, and other controlling residential boundaries in close proximity.

We agree that the PFC modelling has been conducted in a reasonable manner, and we consider it suitable to demonstrate that compliance with the District Plan standards can typically be achieved with the mitigation proposed. Some of the PFC responses reflect the uncertainty inherent in the predictions (for example the higher levels shown in the RFI memo contour for Gould Crescent, and effect of reflections). PFC note this in their own report, referring to a *"typical modelling error of ± 3 dB"*. The discussion in section 6.2 of the Noise Assessment is also helpful, as it confirms that the modelling aligns well with measurements of the existing container yard activity at key residential locations.

It appears likely that with the mitigation proposed, noise from typical operation of the facility can comply with both the District Plan daytime noise limit, and our proposed threshold for 'reasonable noise' (which includes an additional +5 dB penalty for SAC). As outlined above, we consider that along with meeting any proposed limits, there should be a requirement for the operator to adopt good practice management procedures (for example driver training on slow touch-down procedures), to reduce the likelihood of individual higher noise events from the site. In our opinion, this would be consistent with the S16 duty to adopt the "best practicable option" to reduce noise from the site to a reasonable level. These measures could be captured in a Noise Management Plan.

We consider that vibration from some container handling activity, could be perceptible at residential receivers, although good practice management procedures would also reduce the likelihood of such events from the site. This effect, along with the potential for additional reflected traffic noise from the container barrier, have the potential to exacerbate perceived noise effects from the site and we consider that these lend weight to the adoption of our threshold for reasonable noise, which is more conservative than the Plan limits.

Kind Regards,

William Reeve
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Acoustic Engineering Services