

47.5289.L2:MSC



25th October 2017

Ku-ring-gai Council
818 Pacific Highway
GORDON NSW 2072

Attention: Mr J. Goodwill

Dear Sirs,

**REVIEW OF ARUP ASSESSMENT
PROPOSED AGED CARE FACILITY 25, 25A & 27 BUSHLANDS AVENUE, GORDON**

An application for a proposed aged care facility at 25, 25A and 27 Bushlands Avenue, Gordon, has been submitted to Ku-ring-gai Council and included acoustic reports from Rodney Stevens Acoustics.

Our review of the various acoustic assessments prepared by Rodney Stevens Acoustics ("RSA") in relation to the subject application formed the view that the Rodney Stevens Acoustics *Revision 3 North Shore RCF 25, 25A and 27 Bushlands Avenue, Gordon, Mechanical Services Noise Assessment*, dated 4 July 2017 is inadequate in addressing the relevant acoustic issues for the subject application.

The development application has been the subject of objections, of which a report from Acoustic Logic *25 – 27 Bushlands Avenue, Gordon – Proposed aged care facility – review of amended RSA report (revision 3)*, dated 1 August 2007, reference 20170826.1/0801A/R0/TT raises concerns in relation to the revision 3 report from Rodney Stevens Acoustics and identifies inconsistencies in the RSA report and the conclusions (of the RSA report).

Our review of the application was presented in our report 47.5289.R1 *Review of acoustic assessments, Proposed aged care facility 25, 25A & 27 Bushlands Avenue, Gordon* dated 21st September 2017.

The RSA report, the Acoustic Logic review and The Acoustic Group review have been examined by ARUP *Acoustic review for Development Application* (reference AC02(v1) dated 11 October 2017).

With respect to the ambient noise levels and the resultant noise targets, the ARUP report agrees with our findings that the targets provided by RSA were incorrect. We accept the noise targets set out in Table 3 of the ARUP report.

Sleep Disturbance Criteria

With respect to the nominated sleep disturbance criteria, we have a difference of opinion with the material presented by ARUP and suggest that a review of the reference that has been provided (by ARUP) leads to a different interpretation/conclusion to that suggested on page 4 of the ARUP report.

In the first instance it is difficult to accept the suggestion that an aged care facility would be considered an industrial noise source. Therefore, the application of the *Industrial Noise Policy*, which in reality does not mention or provide any criteria for sleep disturbance, becomes questionable.

The EPA in 2006 issued an application note to the New South Wales *Industrial Noise Policy* that is very similar to the reference quoted in the ARUP report but does not agree, in our opinion, with the ARUP suggestion presented on page 4 of the report.

Attachment 1 presents the entire text for the sleep disturbance section from the EPA reference page identified by ARUP.

In viewing Attachment 1 it can be seen that the EPA acknowledged that background +15 dB(A) is not ideal and that there is insufficient evidence to determine what should replace it.

Attachment 1 identifies that there should be an analysis of the extent to which the maximum noise level exceeds the background level and the number of times this happens.

Attachment 1 does not identify that the target of background +15 dB(A) is a threshold concept.

Attachment 1 does not state the sleep disturbance criteria includes all background noise including noise from the project.

The text indicates that guidance on possible impact is contained in the review of research results in the *NSW Road Noise Policy*.

Section 2 of the *NSW Road Noise Policy* presents the assessment criteria and does not include any noise levels related to sleep disturbance.



In Section 5 of the *NSW Road Noise Policy* "Other Road traffic noise issues", subsection 5.4 "sleep disturbance" presents the results of overseas research and provides results of some research including the World Health Organisation 2009 Night noise guidelines for Europe.

Attachment 2 presents the text from subsection 5.4 of the *NSW Road Noise Policy*. It can be seen that the EPA have not identified any sleep disturbance noise target and in particular the last paragraph of that subsection identifies the *DECCW (EPA) will continue to review research on sleep disturbance as it becomes available*.

Examination of Attachment 2 identifies that the EPA have not endorsed the use of maximum noise levels that could be implied from page 4 of the ARUP report.

The reference to the RMS noise manual and policy concept for a threshold is totally irrelevant to the subject application in that the RMS are only interested in noise assessments for major or new road works where the primary issue of the maximum noise level relates to noise from trucks versus the proposed traffic flow and as such is not appropriate for the assessment of a driveway.

Furthermore, it is noted that the nature of noise from vehicles travelling along a public road gives rise to a buildup of sound to a maximum level and then a reduction in sound as a vehicle goes past the assessment location. This is not the same as the noise that would occur from a vehicle ascending a driveway, or for a vehicle descending a driveway, or for the opening or closing of a roller door.

The various sleep disturbance studies that have been undertaken with respect to road traffic noise look at noise from free-flowing traffic and do not consider noise associated with driveways, or opening or closing of a roller door. We submit that noise events associated with the proposed aged care facility that will occur during the night-time period associated with vehicles utilising the driveway is an entirely different noise to that free-flowing traffic upon which the WHO 2009 document suggest maximum noise levels.

Matters before the land and environment Court concerning noise from commercial operations with intermittent traffic at night (typically convenience stores and service stations, aged care facilities and motels) have utilised the background +15 DBA sleep arousal criterion.

Ku-ring-gai Council has previously applied the background +15 DBA sleep arousal criterion for assessing impact on residential amenity for activities at night involving private and commercial tennis courts.



In the matter of Killara Lawn Tennis Club Ltd v Ku-ring-gai Council [2010] NSW LEC 1183 for extended operating hours of the tennis court to 10 PM, the Court imposed a condition for tennis court play after sunset to not create offensive noise, to not create an LAeq, 15 minute level exceeding background +5 dB(A) at any residential property, and not to exceed a maximum level of 15 dB(A) above the background noise when measured outside any bedroom window between 8 pm and 7 am.

In the 2013 version of the EPA's *Noise Guide for Local Government* section 2.2.4 provides the EPA's position that a screening test can be applied with respect to likely disturbance to sleep utilising the background +15 dB(A) limit and that the appropriate descriptor for a source relating to sleep disturbance would be the L_{A1} (1 minute) or L_{Amax} measured outside the bedroom window. Verification of the EPA's statement from the *Noise Guide for Local Government* is set out as Attachment 3.

A further application for the provision of lighting to additional courts at the Killara Lawn Tennis Club is the subject of proceedings before the Court (Proceedings 2017/00187356). The Council is maintaining the same noise criteria and is established by way of measurements and complaints from residents that a breach of the noise conditions (for the current operations) gives rise to a significant level of disturbance.

Accordingly, with respect to the sleep disturbance criteria set out in Table 4 of the ARUP report we reject the suggestion of a minimum external level of 60 dB(A), particularly when utilising the EPA's recommendation, one requires a noise target between the period of 11pm to 6am of $31 + 15 = 46$ dB(A).

ARUP Driveway Assessment

Section 3.1 of the report identifies the community bus will operate as a shuttle service between 6:45 AM and 11 PM on an hourly basis with an allocation of light vehicle movements in the peak hour being nine movements in nine movements out that for the purpose of a 15 minute assessment has been reduced to 2 movements in and to movements out.

However, for the evening and night. Is the assessment considers light vehicle movements to be reduced to one in one out.



There is no identification of the number of staff that will be on duty at the proposed facility, the change over time for the late shift to the night shift. Utilising the Road noise policy document referred to in the ARUP report and the extract provided in attachment 2 EPA require identification of the number of noise events that we exceed the background level during the night-time period. This has not occurred in the ARUP report and the concept of only considering during the entire evening and night period. There would be only one vehicle movement in and one out must be incorrect.

There is a possibility that ARUP intended to mean for the intrusive noise assessment (LAeq over 15 minutes) their analysis has considered one light vehicle in and one light vehicle out for any 15 minute period during the evening and night assessment periods. However, such a limitation would appear to be unlikely particularly when taking into account prior to during and after a shift change.

The sound power levels identified in Table 5 would appear to be reasonable.

The intrusive noise assessment set out in Table 7 requires further clarification when taking into account the sound power levels identified in Table 5 and a number of movements have been allocated in Section 3.1 for the day versus the evening and night time periods. Considering the difference in the number of vehicle movements and the difference in the sound power level associated with the bus versus individual vehicles the slight reduction between the day in the evening periods versus the night-time period suggested dominant noise source is the single bus movement. A sample calculation for assessment location A2 should be provided to substantiate the predicted levels in Table 7.

The results in Table 8 indicate that noise from vehicles (both light vehicles and the bus) exceed the EPA/Council's sleep disturbance criterion background +15 dB(A).

Therefore, additional noise controls are required.

Other Site Activities Assessment

The ARUP report acknowledges there are additional site activities occurring on the premises (which were not addressed by RSA) and are considered to be of low intensity and thus limited potential for acoustic impacts. There is acknowledgement that additional acoustic design is warranted for the theatre space and any other areas may involve some level of audio equipment for entertaining purposes, particularly of these areas are designed to be used during the evening and night period.



This is precisely the basis of raising issue of concern as potential acoustic impacts from common areas that are elevated and may be used during the evening and night period which are yet to be addressed by the plan of management and any specific acoustic requirements as the activities for common areas that may have audio equipment have not been identified.

Conclusion

The ARUP report identifies in the conclusion that they generally concur with the ALC and TAG reports that there were matters not adequately addressed in the RSA report.

The ARUP report has corrected the errors in relation to ambient background level and noise targets pertaining to general noise emission from the site with the project intrusive noise goals set out in table 3 of the ARUP report being appropriate noise targets to be specified for the proposed development.

In relation to sleep disturbance criteria nominated in the ARUP report we disagree with the presentation of mixed criteria that is implied to be supported by the EPA and reject the 60 dB(A) minimum level identified in Table 4 as an appropriate criterion, or the concept in Table 8 where the same number is presented as an upper level for the sleep disturbance criterion.

The Council have adopted in several matters before the Land & Environment Court background +15 dB(A) when assessed outside of bedroom window during a period of 10 pm to 7 am and that acoustic criterion as a minimum must be specified for the proposed development.

The ARUP report has made no assessment of mechanical plant noise. It would appear there is an assumption that such plant would be selected to satisfy the intrusive noise target and that such an assessment would at a later stage, as would an assessment of other site activities.

We query the predicted intrusive noise level set out in Table 7 and recommend that calculations be provided to substantiate the predicted levels. However, it is noted that the application based on the ARUP report reveals excessive noise from vehicle movements on site and that additional noise control measures will be required that in turn would lead to a correction to the predicted intrusive noise level set out in Table 7.



At the present time the proposed residential care facility to be located at 25, 25A and 27 Bushland Avenue, Gordon will give rise to excessive noise during the night time period as a result of the use of the driveway.

The extent of disturbance and the number of occasions of such disturbance require further clarification, together with additional noise control measures.

Yours faithfully,

THE ACOUSTIC GROUP PTY LTD


STEVEN E. COOPER



EPA EXTRACT: <http://www.epa.nsw.gov.au/yourenvironment/noise/industrial-noise/nsw-industrial-noise-policy/applyingindustrial-noise-policy>

Sleep disturbance

Peak noise level events, such as reversing beepers, noise from heavy items being dropped or other high noise level events, have the potential to cause sleep disturbance. The potential for high noise level events at night and effects on sleep should be addressed in noise assessments for both the construction and operational phases of a development. The INP does not specifically address sleep disturbance from high noise level events.

Research on sleep disturbance is reviewed in the NSW Road Noise Policy. This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.

From the research, the EPA recognised that the current sleep disturbance criterion of an LA1, (1 minute) not exceeding the LA90, (15 minute) by more than 15 dB(A) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, the EPA will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.

The detailed analysis should cover the maximum noise level or LA1, (1 minute), that is, the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy. Other factors that may be important in assessing the extent of impacts on sleep include

- how often high noise events will occur
- time of day (normally between 10pm and 7am)
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods)

The LA1, (1 minute) descriptor is meant to represent a maximum noise level measured under 'fast' time response. The EPA will accept analysis based on either LA1, (1 minute) or LA, (Max).



ATTACHMENT 2: Extract from NSW Road Noise Policy

5.4 Sleep disturbance

The disruption of a person's normal sleep patterns, or sleep disturbance, due to road traffic noise, has been the subject of numerous research studies conducted over the last 30 years. Despite intensive research, the triggers for and effects of sleep disturbance have not yet been conclusively determined. Sleep disturbance occurs through changes in sleep state and awakenings. Awakenings are better correlated to subjective assessments of sleep quality than are changes in sleep state, which generally require objective measurement.

Both subjective and measured physiological responses have been observed following exposure to road traffic noise and low frequency noise during sleep. Subjective responses include a negative mood, reduced task performance, irritation, tiredness, less social orientation, anxiety and tension (Waye 2004). Measured differences include an increased length of time to accomplish the transition from full wakefulness to sleep, reduced duration of deep (slow-wave) sleep, corresponding increases in rapid eye movement sleep and nocturnal awakening, and a variation in cortisol levels during sleep and after awakening in the morning, indicating a potential disruption of the body's circadian rhythm (Waye et al 2002, 2004; Waye 2004).

Individuals describing themselves as sensitive to noise tend to be more affected by it. The potential for sleep disturbance of shift workers who typically sleep during day-time periods was just as great as for night-time sleepers. It is also apparent that sleep disturbance due to noise is not diminished over time and some cumulative negative effects may occur (Ohrstrom et al 1988).

A summary of the current literature concerning sleep disturbance due to noise indicates that the main noise characteristics that influence sleep disturbance are the number of noisy events heard distinctly above the background level, the emergence of these events and the highest noise level.

The L_{Aeq} , which is the energy average level of the noise signal, accounts for the number and level of the louder events in a signal, due to the high amount of energy such events carry. However, the consensus is that L_{Aeq} by itself is an inadequate predictor of the potential of a varying noise to disturb sleep. For continuous traffic flow, L_{Aeq} appears to be acceptably correlated with sleep disturbance, since under these conditions there are few emergent noise events above the main hum of the traffic. However, for intermittent traffic flow, which often occurs at night, some other measure that takes into account the emergence, described by measures such as $(L_{AFmax}-L_{Aeq})$ or $(L_{AFmax}-L_{AF90})$, the highest level of noise and the number events may be needed to obtain a better correlation with sleep disturbance.

The World Health Organisation guidelines (World Health Organisation 1999) recommended that:



'where noise is continuous, the equivalent sound pressure level should not exceed 30 dB(A) indoors, if negative effects on sleep are to be avoided'.

Further studies by the enHealth Council (2004) and the guidelines published by the World Health Organisation (1999) were reviewed and analysed in terms of the guidance on noise exposure and sleep disturbance. The enHealth report states that:

'as a rule for planning for short-term or transient noise events, for good sleep over 8 hours the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately 45 dB(A) $L_{A, (Max)}$ more than 10 or 15 times per night'.

The Night noise guidelines for Europe (World Health Organisation 2009) comprehensively reviewed policy and research on:

- methods and criteria for measuring night-time noise
- the relationship between sleep and health
- the effects of night-time noise on sleep
- the effects of night-time noise on health and wellbeing.

Long-term effects, such as cardiovascular disorders, are more correlated with noise indicators summarising the situation over a long period, such as $L_{Anight, outside}$ whereas instantaneous effects such as sleep disturbance are better linked to the maximum noise level per event (L_{Amax}).



The NSW Roads and Traffic Authority is tackling the issue of engine brake noise. Photo: DECCW



The World Health Organisation report (2009) uses $L_{\text{Anight,outside}}$ as a primary measure of night-time noise. This is the yearly average of outside façade noise levels during the night-time period, and roughly equivalent to the L_{Aeq9hour} night-time descriptor.

Groups vulnerable to night noise exposure include the elderly and shift workers; children tend to be less sensitive. The report concluded that, although individual responses may vary:

- at $L_{\text{Anight,outside}}$ levels of <30 dB(A), no substantial biological effects are observed at $L_{\text{Anight,outside}}$ levels between 30 dB(A) and 40 dB(A), a number of effects are observed, but their impact is modest
- at $L_{\text{Anight,outside}}$ levels between 40 dB(A) and 55 dB(A), adverse health effects are observed, with many people needing to adapt their lives to cope; vulnerable groups are more severely affected
- at $L_{\text{Anight,outside}}$ levels above 55 dB(A), adverse health effects occur frequently, and a sizeable proportion of the population is highly annoyed and sleep disturbed. Cardiovascular disease risk rises, and public health is also threatened.

The report recommends a long-term $L_{\text{Anight,outside}}$ noise guideline level of 40 dB(A), with an interim $L_{\text{Anight,outside}}$ target level of 55 dB(A). The interim target is only intended as an intermediate step in localised situations as health impacts, particularly on vulnerable groups, are apparent at this noise level.

From the research on sleep disturbance to date it can be concluded that:

- maximum internal noise levels below 50–55 dB(A) are unlikely to awaken people from sleep
- one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly.

The Environmental criteria for road traffic noise (Environment Protection Authority NSW 1999) discussed a guideline aimed at limiting the level of sleep disturbance due to environmental noise – that the $L_{\text{AF1, 1 minute}}$ level of any noise should not exceed the ambient L_{AF90} noise level by more than 15 dB. This guideline takes into account the emergence of noise events, but does not directly limit the number of such events or their highest level, which are also found to affect sleep disturbance.

Triggers for, and effects of sleep disturbance from, exposure to intermittent noise such as noise from road traffic are still being studied. There appears to be insufficient evidence to set new indicators for potential sleep disturbance due to road traffic noise. The NSW Roads and Traffic Authority's Practice Note 3 (NSW Roads and Traffic Authority 2008a) outlines a protocol for assessing and reporting on maximum noise levels and the potential for sleep disturbance.

DECCW will continue to review research on sleep disturbance as it becomes available.



ATTACHMENT 3: Extract from EPA's Noise Guide for Local Government (May 2013)

2.2.4 Assessment of sleep disturbance

Currently, there is no definitive guideline to indicate a noise level that causes sleep disturbance and more research is needed to better define this relationship. Where likely disturbance to sleep is being assessed, a screening test can be applied that indicates the potential for this to occur. For example, this could be where the subject noise exceeds the background noise level by more than 15 dB(A). The most appropriate descriptors for a source relating to sleep disturbance would be LA1 (1 minute) (the level exceeded for 1% of the specified time period of 1 minute) or LAmax (the maximum level during the specified time period) with measurement outside the bedroom window.

