



Benbow Environmental

News Update

Summer 2013

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BENBOW ENVIRONMENTAL— NOISE & ACOUSTICS

Benbow Environmental are recognised nationally as specialists in the field of noise and acoustics with extensive experience in solving noise problems and providing practical detailed noise control designs.

We use a comprehensive range of noise instruments, including data loggers (class 1 & 2), class 1 sound level meters and sound intensity analysers. Combined with our knowledge of modelling programs including Concawe, Soundplan, ENM and TNOISE, this enables us to solve noise matters from straightforward noise monitoring or compliance testing, to more detailed projects to assist with regulatory approvals and development applications.

Benbow Environmental can also specify appropriate control measures, design solutions and provide noise management plans. Occupational, transport and architectural noise are also a speciality.

Projects Benbow Environmental have worked on include:

- Aircraft noise
- Quarries
- Traffic and heavy truck noise studies, traffic management plans and truck noise management
- Motorsports
- Design of industrial plants for operation 24 hours a day
- Music venues and festivals
- Compliance testing
- NSW EPA and council approvals
- Community consultation



Noise: A matter not to be undervalued

Exposure to industrial noise and road traffic noise can cause not only short term effects on the community, such as negative mood, irritation, tiredness, anxiety and tension, but also major effects like cardiovascular disorders (Babisch W. 1998; Babisch et al. 2005; Carter 1998).

Research into treating noise-related health issues has significantly increased over the past twenty years, demonstrating the fact that noise issues are an important matter not to be undervalued.

The importance of noise-related health issues has been considered by the NSW Environment Protection Authority (EPA), resulting in the publication of two important documents:

'*Industrial Noise Policy*', which aims to allow the need for industrial activity to be balanced with the desire for quiet in the community; and

'*Road Noise Policy*', which has the scope of providing protection from traffic noise inside and immediately around residences, schools, hospitals, and all other sensitive land uses.

Recently, Benbow Environmental carried out an extensive noise study related to the operation of a well known paper mill. The scope of the study was to assess and reduce the noise impact from the paper mill as well as from the site-related road traffic noise.

Noise emissions from the site were found to not comply with established noise criteria, and noise levels at the nearest residences were likely to cause negative effects on the community, particularly throughout night time hours.

Noise exposure throughout the night time period can involve a series of health issues related to sleep disturbance. In

fact, the day following a noise-disturbed night, sleep deprivation effects may appear such as lack of vigilance or microsleeps, which increase the risk of car accidents or on-the-job injuries (Fruhstorfer et al. 1984; Sato et al., 1993).

In the long term, chronic sleep deprivation is reflected in attention, concentration and memory alteration. This can lengthen decision time, create apathy, dysarthria (a motor speech disorder), postural trembling and ataxia (problems with coordination) (West 1967).

These health effects could potentially appear at noise levels of 35 dB(A) during the night time (WHO 2009), however the World Health Organisation recommends individual noise events to be contained under 45 dB(A) L_{Amax} indoors in order to minimise sleep disturbance and the number of such events should be less than 10–15 events per night for a good night's sleep (enHealth Council 2004). Where noise is continuous a limit of 30 dB(A) for the L_{Aeq} when assessed indoors is recommended (WHO 1999).

A number of noise mitigation measures were recommended by Benbow Environmental such as: non-tonal reverse beepers, noise enclosures, silencers, noise barriers, a combination of different materials for various building elements, and enforced on-site speed limits.

These mitigation measures significantly reduced noise emissions from the site, consequently achieving compliance with the noise criteria and therefore minimising negative health effects.

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Acoustic design—An integrated approach

Benbow Environmental is currently involved in the acoustic design for a multi million dollar development located in Sydney which encompasses:

- design of exterior façade materials for the primary building;
- fan body, connecting duct work and stack outlet; and
- on-site traffic noise and boundary wall specifications.

Due to the numerous groups of identified on-site noise sources, individual noise criteria were applied to each group singly, the sum of which equalled the overall noise criteria for the entire site. This allowed for each group of noise sources to be assessed individually which simplified the assessment process.

Throughout all stages of this industrial noise assessment, SoundPLAN (Sound Propagation Modelling Software—considered the market leader for noise modelling software) was utilised. The software specializes in computer simulations of noise situations implementing more than 50 calculation standards and encompassing all facets of noise modelling ranging from traffic noise, occupational noise, indoor and outdoor noise to industrial and aircraft noise. SoundPLAN allows accurate calculation of adverse noise impacts such as exceedances against the following criteria:

- Intrusive noise (noise impacts over the short term i.e. 15 minutes);
- Amenity noise (noise impacts over the long term i.e. day, evening and night);
- Sleep disturbance; and
- Road traffic noise;

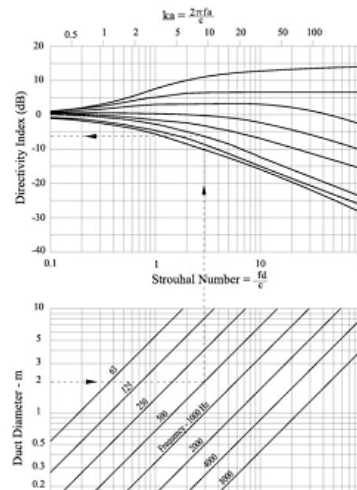
This consequently allows for the specification and/or design of adequate noise control measures, where required.

For example, several noise control measures were required in order for noise emissions associated with the subject site to achieve compliance with project criteria.

Much research was undertaken into the transmission loss properties of several potential wall materials and combined wall systems. Resulting from this research and the predictive noise modelling, two wall systems were selected for use within the primary building's exterior facades. For sections of the exterior wall which did not contribute a significant amount to the overall noise level at the receiver locations, a base wall system consisting of two steel cladding panels separated by an air cavity which also contained absorptive material, was specified. While for sections of the exterior wall which did significantly contribute to the overall noise level at the receiver locations an additional 'high performance, flexible mass-loaded vinyl noise barrier' product supplied by 'Pyrotek—noise control' was included in the base wall system. Application of the 'Pyrotek—noise control' product can be seen in Figure 1.



Figure 1: Application of 'Pyrotek—noise control' product.



Source: 'Duct Directivity Index Applications' (Day et al. 2009).

Figure 2: Duct Directivity Chart

Similarly, research was carried out with respect to duct directivity index for the prediction of noise emissions associated with fans servicing the primary building. The basic principles of duct directivity were obtained from a document titled 'Duct Directivity Index Applications', (Day, et al. 2009), in which a duct directivity chart (Figure 2) was utilised in order to obtain the relevant sound pressure level gains and losses as a function of frequency and angle

from the outlet of the duct. This process was repeated for the varying duct diameters and the data inserted into the SoundPLAN predictive model.

Detailed and accurate modelling of on-site traffic noise emissions based on the estimated production capacity and daily operations was undertaken resulting in the design and assessment of a significant noise barrier in order to shield vehicle noise from nearby residential receivers. Noise data of various heavy vehicles, clamp-trucks and fork-lifts were sourced from on-site noise measurements undertaken by a qualified acoustic engineer. An example of a typical truck frequenting the site can be seen in Figure 3.



Figure 3: Semi-trailer delivering material

Following the predictive modelling of on-site vehicles, an extensive wall design process considering transmission loss properties, diffraction attenuation, wall height, wall placement, etc was undertaken, the result of which provided compliance with the appropriate noise criterion.

As this extensive acoustic assessment approaches the end, BE is both confident and proud of the results achieved so far. Protecting the community from adverse noise impacts and providing engineered solutions to industrial premises allows both to exist side by side.

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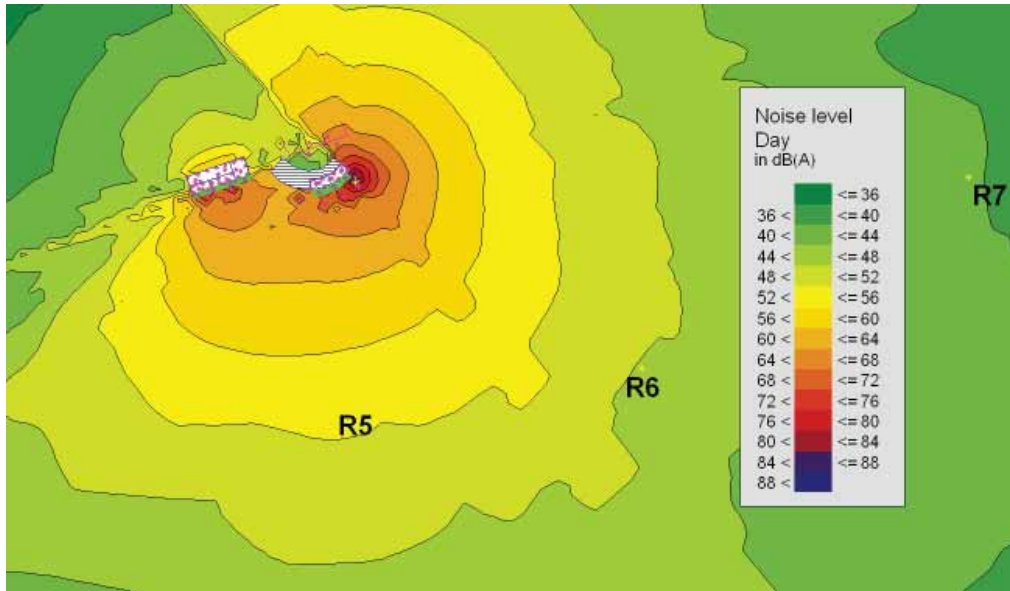
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Office of Liquor, Gaming & Racing—Noise criteria

In order to satisfy council requirements, most industrial noise impact assessments are carried out in accordance with guidelines established within the NSW EPA Industrial Noise Policy (INP). However, noise from licensed premises, such as pubs, restaurants and nightclubs are regulated by the NSW Office of Liquor, Gaming and Racing (OLGR) guideline. This guideline is considered to be significantly more stringent as it requires that the L_{A10} noise levels from licensed premises shall not exceed the existing background noise level (L_{A90}) for any Octave Band Centre Frequency (31.5 Hz–8k Hz) by 5 dB or 0 dB between 7:00 am–00:00 am and 00:00 am–7:00 am respectively.

Figure 1: Noise Model Results, L_{A10}



Recently, BE completed a noise impact assessment for a large marina located in the City of Sydney. Long-term unattended noise monitoring was carried out using Acoustic Research Laboratories (ARL) Statistical Environmental Noise Loggers, (Ngara) at several locations within the vicinity of the subject site in order to measure existing background noise levels of the area.

A predictive model created in SoundPLANv7.1 modelling software with configured scenarios helped provide a realistic assessment of potential site-related noise emissions (Figure 1). Primary noise sources included: outdoor live bands, outdoor seating areas on balconies and terraces, function facilities within the buildings, café, restaurant, takeaway shops and bars, air conditioning plants, fan units on the roof and a car park.

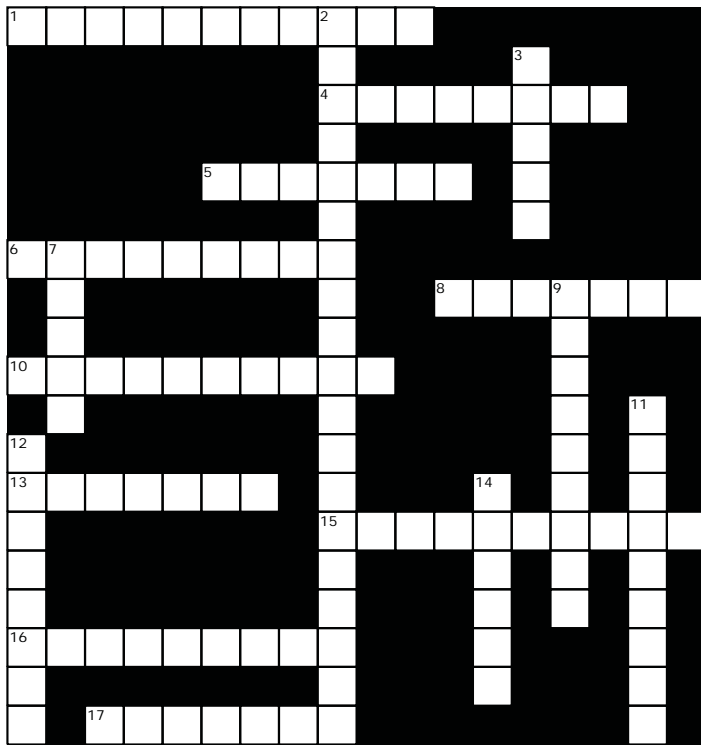
Due to factors such as the close proximity between the development and the most sensitive receivers, the proposed 24 hours of operation, the significant number of guests (1425 people) and the great number of facilities, the predicted noise levels in most of the frequency bands did not comply with the noise limits by up to 11 dB at several residential receiver locations. Compliance was not achievable primarily due to live music acts. Therefore, noise mitigation measures and recommendations such as acoustical treatment of building facades with adequate noise transmission loss; time of operation restrictions of the use of balconies, terraces and outdoors areas; noise barriers; limitation of the volume of sound from the loudspeakers that will amplify the live band; and a detailed noise management plan, were provided as a means to reduce the potential for noise impact associated with the subject marina and therefore enabled the marina to comply with established OLGR and NSW INP noise criteria.

Noise emissions from licensed venues can have a negative impact on the social amenity of a neighbourhood and on an individual's health and wellbeing. In order to maintain the noise impact of such venues to a minimum, strategies such as noise impact assessments and acoustical treatments (mentioned above) need to be implemented. Benbow Environmental has qualified acoustical engineers and the necessary noise equipment technology (Figure 2) to conduct satisfactory noise impact assessments regarding industrial (NSW INP) and commercial (OLGR) developments, providing a range of noise control options which are available with practical pricing and timing.

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Figure 2: Environmental Noise Logger, Ngara





Benbow Environmental Noise Crossword



Across

- 1 Feasible and useable
- 4 Noise can cause these type of health impacts
- 5 A high performance, flexible mass-loaded vinyl noise barrier
- 6 Noise criteria for impacts over the short term
- 8 Type of transparent layer that joins glass panels in laminated glazing
- 10 A type of acoustic window treatment
- 13 A condition of this type has long lasting effects
- 15 Sleep deprivation can cause this
- 16 Benbow Environmental specialise in this type of noise
- 17 A measure of sound based on human hearing

Down

- 2 Environmental consultants with experience in acoustic design
- 3 Noise exposure throughout this period can involve a series of health issues related to sleep disturbance
- 7 Unwanted sound
- 9 Sound Propagation Modelling Software
- 11 Concawe, Soundplan, ENM and TNOISE are this type of noise program
- 12 The sense of hearing, or the science of sound
- 14 Equipment used to monitor long term noise

(Answers in Autumn issue)

SOUND INSULATION TREATMENT FOR WINDOWS

Windows can be acoustically treated to provide sound insulation, but what treatment provides the best noise reduction? For single glazed windows, increasing the glass thickness by 15 mm reduces noise by 7 dB. Surprisingly, double glazing provides less sound insulation than the same total glass thickness as single glazed windows. Triple glazing does not improve the sound insulation unless the air gap is quite large. Further treatments to improve sound insulation include:

- Combining glass panes with different thicknesses (asymmetric glass panes);
- Laminated glazing—joining glass panels with a transparent elastic layer;
- Replacing air in double and triple glazing with an inert, non-toxic gas.

Combining the above three treatments can achieve up to 45 dB sound reduction.

Source: http://www.auglass.com.au/downloads/sound_insulation.pdf

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Next issue:

- Soil gas sampling—TCE
- Noise sources localization—Acoustic camera
- Sustainable energy solutions
- Rail noise—Interpreting the guidelines



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Engineering a Sustainable Future for Our Environment

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