

## **6.5 Noise - proposed introduction of outdoor ambient dining music**

Reports from:

- Biosis (2015), assessing the proposed introduction of ambient outdoor dining music to the restaurant area, including potential impacts on Little Penguins
- Wilkinson Murray (2015), assessing baseline noise conditions in relation to the proposed introduction of ambient outdoor dining music to the restaurant area, including potential impacts on Little Penguins.

9 February 2015

Mr Michael Chilcott  
Director  
Linchpin Environmental Pty Ltd  
PO Box 598  
LANE COVE NSW 1595

## **North Head Quarantine Station Modification – Potential Impacts on Little Penguins**

**Our Ref: Matter 19518**

### **Background**

Biosis Pty Ltd. was engaged to undertake a desktop evaluation of the potential impacts of anthropogenic noise, specifically amplified music, on Little Penguins *Eudyptula minor* at the North Head Quarantine Station, Manly, New South Wales. The North Head Quarantine Station site is located within the Manly Local Government Area and partly within and adjacent to the Sydney Harbour National Park.

In 2006, the former Quarantine Station site was adapted and re-developed into a cultural tourism venue which included the establishment of a visitor centre, museum, restaurants, accommodation and function and conference spaces. The adaptive re-use of the Quarantine Station site has been undertaken in accordance with Conditions of Planning Approval (CoPA), including Condition 201, which establishes the basis for the management of amplified music at the site. Specifically, Condition 201 states that there should be no amplified music in outdoor areas. The proponent is seeking a modification to Condition 201 such that amplified ambient dining music is permitted within outdoor dining areas. In order to process the request for modification to Condition 201, the NSW Department of Planning and Environment have issued the Secretary's Environmental Assessment Requirements (SEARs) which request further information about the potential impacts of noise on Little Penguins.

Specifically, the proponent has advised that any amplified music permitted in outdoor dining areas would be limited to daytime hours only (9am to 5pm), and would be limited to a noise level of LAeq 50dB (A) as measured up to the limit of the outdoor dining area. This limit is in line with accepted noise limits for outdoor amplified music in most small settings, and is consistent with the current limits for indoor music under the Q Station CoPA.

The population of Little Penguins located at North Sydney Harbour is the only known breeding population of Little Penguins on mainland NSW. In 1997, the population was declared an Endangered Population under Schedule 1 of the *Threatened Species Conservation Act 1995* (TSC Act). Critical Habitat for the population has also been declared under the TSC Act around Manly Point and from Cannae Beach to the eastern side of Little Manly Point (NPWS 2002). A recovery plan has been prepared for the population, which documents known threats and management objectives (NPWS 2000). During the 2013-2014 breeding season, a total of 20 active burrows and 16 breeding pairs of Little Penguins were recorded between Cannae Point and the southern end of Store Beach (OEH, unpubl. data 2015). Penguin breeding burrows occur at least 15 metres from the Q

Station restaurant building and 3-4 metres from the enclosed outdoor eating area on Quarantine Beach (M. Chilcott, Linchpin Environmental, pers. comm. 2015).

This investigation uses two approaches to inform an evaluation of potential impacts of noise on the endangered population of Little Penguins at Manly:

- Undertake a literature review of the potential impacts of noise on fauna
- Undertake a review to determine what impacts noise may be having on other populations of Little Penguins

## Methods

In order to locate journal articles and other scientific literature addressing the impacts of noise on wildlife, particularly penguins and other nesting seabirds, relevant keyword searches were undertaken of a number of online databases and e-journals including:

- Science Direct <http://www.sciencedirect.com/>
- CSIRO Publishing journals <http://www.publish.csiro.au/nid/17.htm>
- Google Scholar <http://scholar.google.com.au/>

In addition, Zoe Hogg, St Kilda Penguin Research Team Leader, was consulted on 12 January 2015 to obtain specific information about an urban population of Little Penguins where anthropogenic noise is present as a potential impact.

The literature search and consultation undertaken was not intended to be an exhaustive search of all relevant literature, rather it was intended to provide a brief background and context for the current study. It is therefore likely that a number of relevant studies were not identified, however this is not believed to be a factor influencing the findings presented in this letter.

## Results

### Literature review

There are a number of studies that address the impact of anthropogenic noise on wildlife, however the majority of literature addresses chronic noise associated with air traffic, road traffic or resource extraction. No studies were found that specifically addressed the potential impacts of amplified music on wildlife. The literature highlights a number of issues with quantifying the impacts of noise on wildlife. In general, literature on noise disturbance does not, or has been unable to isolate noise from other potential sources of disturbance, therefore the independent contribution of noise as a disturbance force remains largely ambiguous (Barber *et al.* 2009). In many studies, noise is directly linked to an associated visual disturbance source such as overflying aircraft (e.g. Hughes 2008), vehicle traffic or humans on foot. In this case, it is very difficult to isolate the auditory component, particularly when attempting to measure the response of wild populations where controlling for confounding variables is inherently challenging (Barber *et al.* 2009).

Despite the inherent issues with isolating noise as an independent disturbance force, a range of impacts have been observed in wildlife exposed to artificially elevated noise levels. Exposure to chronic noise caused by air or road traffic has been attributed to significant behavioural changes in species that use vocalisations to communicate with conspecifics. For example, changes in the frequency and amplitude of vocalisations have

been recorded in some species that are exposed to elevated noise levels (e.g. Brumm 2004). Calling frogs have also been found to reduce or cease their calling activity altogether when exposed to elevated noise levels (e.g. Lengagne 2007). These changes in calling behaviour can impact on pairing success and social group structure, and therefore breeding success (Habib et al. 2007).

By impacting on the ability of individuals to perceive other sounds in their environment, chronic noise exposure can also impact on predator and prey detection, and therefore result in reduced body condition, reduced breeding success and increased predation rates (Barber *et al.* 2009; Warren *et al.* 2006). It must be noted that all of these studies address chronic noise that is significantly louder than the amplified music proposed for North head Quarantine Station.

### **Observations from some other Little Penguin populations**

Little Penguins are a highly vocal colonial nesting species and are known to use vocalisations in territorial disputes, to locate chicks and partners and as contact calls whilst foraging in groups at sea. Studies have demonstrated that Little Penguins are also capable of individual call recognition (Waas 2006). The species therefore has the potential to be impacted by any excessive noise that masks their vocalisations or impacts on their ability to hear the vocalisations of conspecifics.

Within their distribution, a number of Little Penguin breeding colonies in Australia and New Zealand are the focus of tourism attractions or are located in urbanised areas, where anthropogenic noise is a possible disturbance factor. A Little Penguin colony located on the Summerland Peninsula, Phillip Island, Victoria, is home to an estimated 32,000 breeding Little Penguins and is also the focus of a major tourism operation that attracts over 500,000 visitors each year (<http://www.penguins.org.au/attractions/penguin-parade/>). A previous analysis of breeding data has demonstrated that rates of breeding productivity and recruitment of Little Penguins nesting within the tourist areas, and therefore exposed to human visitation, artificial lighting and increased background noise, are not significantly different to rates observed in areas with no public access (Dann 1992).

Another example of a Little Penguin population directly exposed to human disturbance is the breeding colony located in St Kilda, approximately 5 km south of the Melbourne CBD. Little Penguins at the St Kilda colony nest between large boulders that form the artificially constructed breakwater located at the end of St Kilda pier. Penguins were first recorded breeding on the breakwater in 1974 and now the breakwater is currently estimated to support approximately 1200 adult penguins (Z. Hogg, Earthcare St Kilda, pers. comm. 2015). The surrounding area is highly urbanised and exposed to a number of associated sources of disturbance including human visitation, domestic dogs, artificial lighting, boat traffic, litter and noise. A major source of noise at the site is the St Kilda Kiosk and Little Blue Restaurant, both located within the historic St Kilda Kiosk building at the entrance to the breakwater. Since approximately 2006, the building has featured a large outdoor dining space and has broadcasted amplified music, particularly on Saturday nights when bands and DJs occasionally perform at the venue (Manager, Little Blue Restaurant, pers. comm. 2015). Little Penguins have been recorded nesting within 2 metres of the St Kilda Kiosk building (Z. Hogg, Earthcare St Kilda, pers. comm. 2015). Recent anecdotal evidence also suggests that the density of penguin burrows remains consistent across the entire length of the breakwater, therefore proximity to the St Kilda Kiosk and associated noise appears to be having little, if any, impact on the St Kilda penguins (Z. Hogg, Earthcare St Kilda, pers. comm. 2015).

Despite their urban setting and exposure to numerous sources of anthropogenic disturbance, Little Penguins from the St Kilda population have consistently exhibited higher breeding success and higher body mass than penguins from the Phillip Island population, which is believed to be largely due to the presence of a local and reliable food source in Port Phillip Bay (Earthcare St Kilda, unpubl. data; Z. Hogg, Earthcare St Kilda, pers.

comm. 2015). Exposure to anthropogenic noise is therefore likely to be a negligible factor affecting population dynamics and body condition compared to other major documented factors such as prey availability, predation, climatic conditions, litter entanglement and oil spill events. These observations are consistent with studies from other penguin populations that have demonstrated that environmental factors such as prey availability exert greater effects than human disturbance (e.g. Carlini *et al.* 2007).

## Conclusion and Recommendations

Based on the literature review, observations from other Little Penguin populations and from the absence of any observed effects resulting from the current operation of the Quarantine Station, it is considered unlikely that the proposed introduction of amplified music will result in any adverse impacts on Little Penguins. The key factors taken into consideration for this determination include:

- The amplified ambient dining music is unlikely to significantly exceed existing background noise at the Quarantine Station site.
- Little Penguins are known to nest and breed successfully within close proximity to outdoor dining and amplified music at the St Kilda breeding colony.
- Amplified music is only proposed to be broadcast between 9am and 5pm. Little Penguins are least active at terrestrial burrows during daylight hours.

While impacts to Little Penguins are considered unlikely, the potential for impacts to occur should still be addressed within an adaptive management framework for the North Head Quarantine Station, where appropriate monitoring requirements are outlined and specific thresholds that trigger the need for a management response are included. If the introduction of amplified music in outdoor dining areas is identified to be impacting on adjacent nesting Little Penguins using an adaptive management system, appropriate responses could include:

- Installation of temporary or permanent acoustic sound barriers.
- Cessation of broadcasting amplified music in outdoor dining areas during the Little Penguin breeding season (generally between late August and February, but highly variable).
- Reduce the volume and duration of amplified music during the Little Penguin breeding season.

Based on the findings presented in this letter and the presence of a monitoring program and adaptive management system, it is considered unlikely that the proposed modification to Condition 201 (introduction of limited amplified music) will result in any adverse impacts on Little Penguins at the North Head Quarantine Station.

Please contact me if you have any further enquiries.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Clare McCutcheon', with a long, sweeping underline.

Clare McCutcheon

Consultant Zoologist

**0417 135 517**

## References:

- Barber, J. R., Crooks, K. R. and Fristrup, K. M. (2009). The costs of chronic noise exposure for terrestrial organisms. *Trends in Ecology and Evolution* **25**: 3, 180-189.
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29 October 2015

WM Project Number: 15331  
Our Ref: Ltr\_MC\_SF\_291015

Michael Chilcott  
Linchpin Environmental Pty Limited  
PO Box 598  
LANE COVE, NSW 1595

Dear Michael

**Re: BASELINE NOISE MONITORING - QUARANTINE STATION**

The NSW Office of Environment and Heritage (OEH) and National Parks and Wildlife Service (NPWS) manages the historic Quarantine Station located at North Head, Manly. The site is part of Sydney Harbour National Park and is home to an endangered population of Little Penguins and Long-Nosed Bandicoots.

The Boilerhouse Harbourside restaurant currently operates on the site at a location adjacent to Quarantine Beach. The restaurant has an external deck area which is used for dining during the summer months. It is proposed to use background ambient music within the external dining area during evening dinner service between 6.00pm to 10.00pm, up to 7 days per week. Penguins are known to nest in the general area surrounding the external dining area.

At the request of NPWS Wilkinson Murray has undertaken a baseline noise monitoring assessment to evaluate the level of existing ambient and background noise levels to which the penguins are currently exposed to and to provide an opinion as to the extent of any impact that the proposed background dining music may have on the penguin population and their nesting habits. In this regard it should be noted that the degree of penguin sensitivity to noise is not well understood.

Figure 1 shows the location of the restaurant and the noise monitoring location.

**Figure 1: Site Layout Showing Noise Monitoring Location**

Background noise levels were measured near the penguin's natural habitat at the location shown in Figure 1 using an ARL-215 environmental noise logger. The logger was set to A-Weighted, Fast response and programmed to continuously monitor and record statistical noise levels over 15 minute sampling periods, between 14 to 22 October 2015. The logger calibration was checked before and after the survey and no material drift occurred.

The noise levels measured over the entire monitored period are shown graphically in Appendix A. For definitions of the acoustic parameters shown on the plots refer to the glossary of terms included in Appendix B.

It is clear from the fluctuations seen in the plots that the measured noise level are influenced by the ocean and wind conditions.

The noise logger enables the calculation of an Assessment Background Level (ABL), i.e. the single figure background level representing each assessment period (day, evening and night) for each day. It is determined by calculating the 10<sup>th</sup> percentile (lowest 10<sup>th</sup> percent) background level ( $L_{A90}$ ) for each period.

Table 1 summarises the measured ABLs over the entire monitoring period, the range of the measured ABLs and the lowest ABLs. Additionally the ambient  $L_{Aeq}$  levels are shown. In deriving the ABLs, any effects due to extraneous noise sources or adverse weather (rain and wind greater than 5m/s at a height of 1.5m) have been excluded from the analysis. Meteorological data collected during the noise monitoring period at the North Head met station was reviewed for this purpose and some occasions of high winds and rain were noted and excluded.

From the ABLs it is usual practice to determine Rating Background Levels (RBLs) which are the median of the ABL values over all days. For the purpose of this assessment, however, given the variation due

to ocean and wind conditions it is considered appropriate to apply the lowest determined ABL in lieu of the RBL as the basis for further assessment. The lowest ABL value is representative of the background noise level of a typical calm day.

**Table 1: Background and Ambient Noise Levels Measured Near Penguin Habitat Area**

Date	Assessment Background Level (ABL, LA90 dBA)			Ambient Noise Level (LAeq dBA)		
	Day	Evening	Night	Day	Evening	Night
	(7.00am to 6.00pm)	(6.00pm to 10.00pm)	(10.00pm to 7.00am)	(7.00am to 6.00pm)	(6.00pm to 10.00pm)	(10.00pm to 7.00am)
14-Oct-15	-	43	38	-	60	51
15-Oct-15	43	43	35	55	52	56
16-Oct-15	43	41	35	58	53	49
17-Oct-15	41	37	35	55	59	46
18-Oct-15	39	36	34	52	61	52
19-Oct-15	41	44	36	54	56	47
20-Oct-15	43	41	37	63	57	57
21-Oct-15	41	39	37	52	58	48
22-Oct-15	40	-	-	58	-	-
<b>Range</b>	39 - 43	36 - 44	34 - 37	52 - 63	52 - 61	46 - 57
<b>Lowest ABL</b>	<b>39</b>	<b>36</b>	<b>34</b>	-	-	-

Dining music would not be expected to ordinarily exceed levels of LAeq 60-65 dBA within the external dining area as levels greater than this can begin to hinder conversation. It is expected that between the dining area and the penguin nesting areas, some 20 dB attenuation would be achieved from setback distance and shielding provided by the existing boundary fence, as shown in Figure 2. Therefore ambient music levels would not be expected to exceed levels of approximately LAeq 40-45 dBA within the penguin nesting areas.

Whilst the degree of penguin sensitivity to noise is not well understood, other studies suggest that levels such as these would not be expected to cause adverse impacts on fauna. Other studies have shown that after habituation orienting behaviour of wildlife is not typically affected below levels in the order of approximately 70 dBA.

**Figure 2: External Dining Area and Boundary Fence**



I trust this information is sufficient. Please contact us if you wish to proceed with the detailed assessment or if you have any further queries.

Yours faithfully

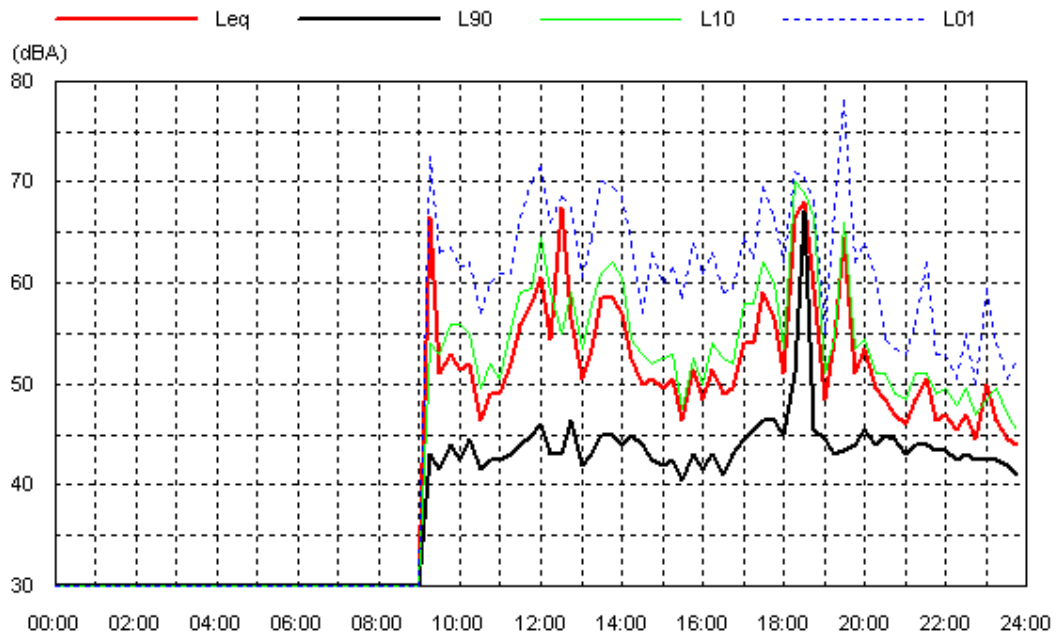
**WILKINSON MURRAY**

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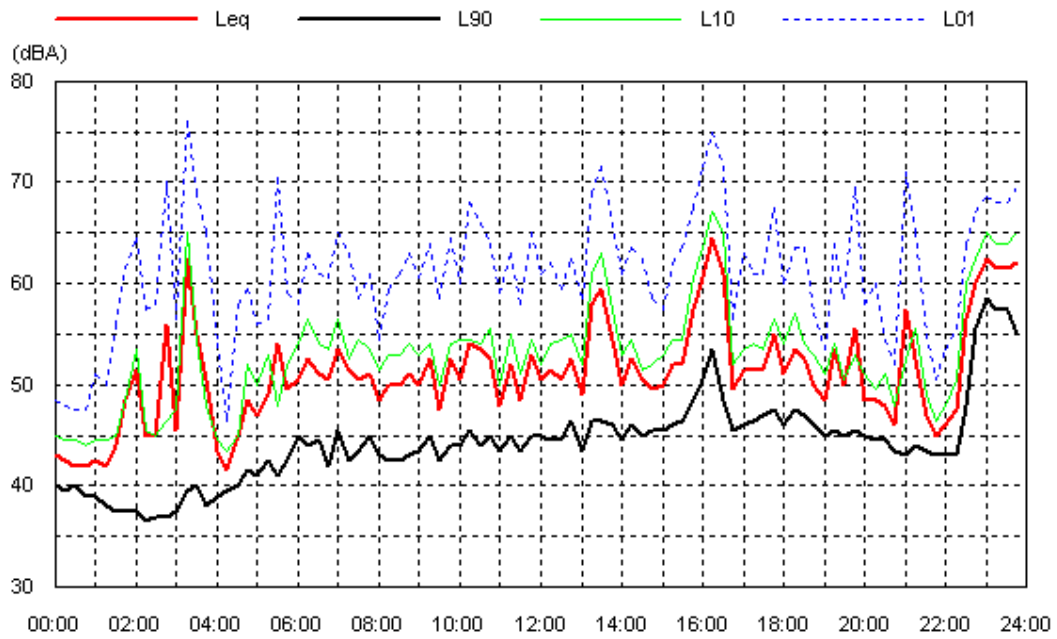
**Sean Flaherty**

Senior Engineer

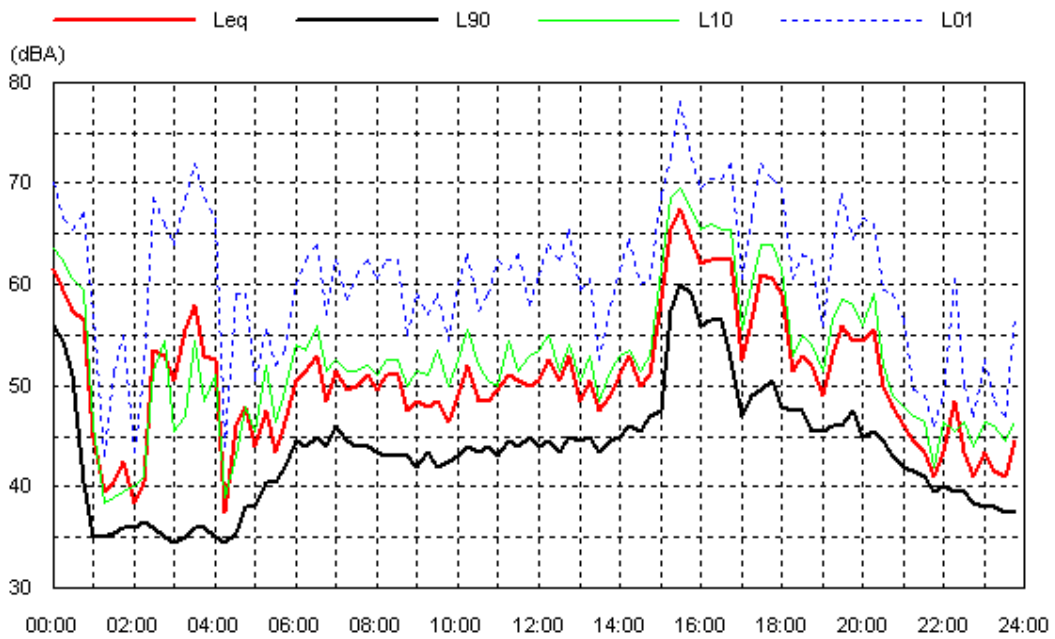
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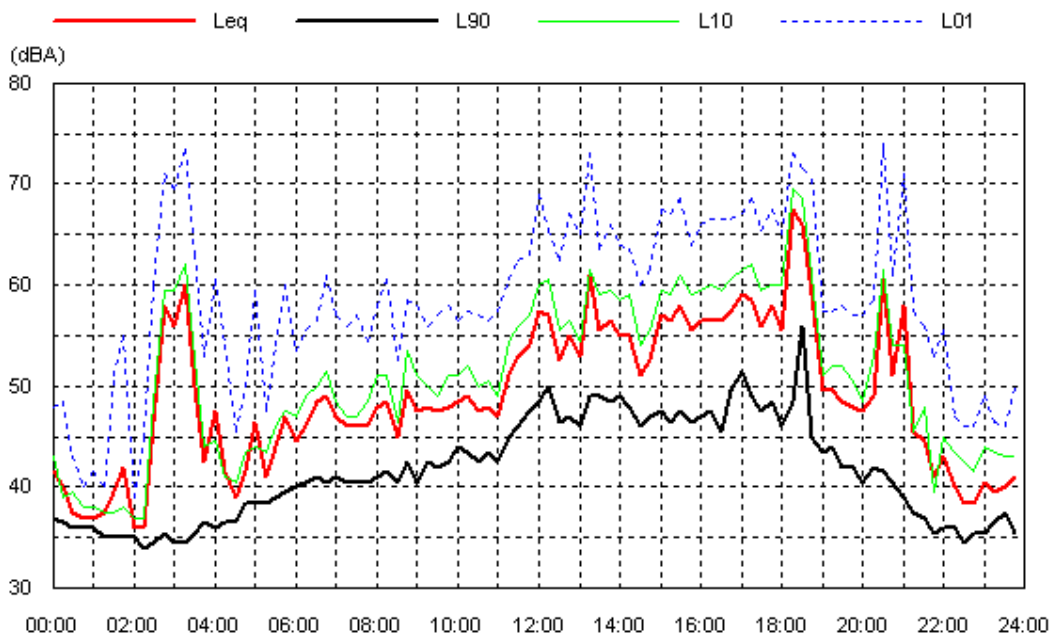
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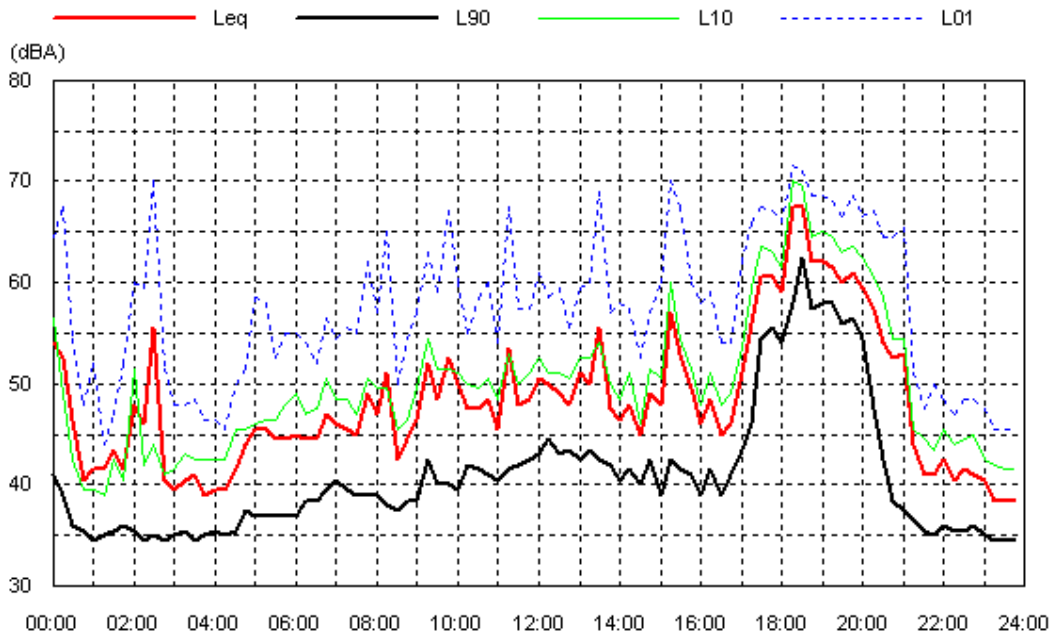
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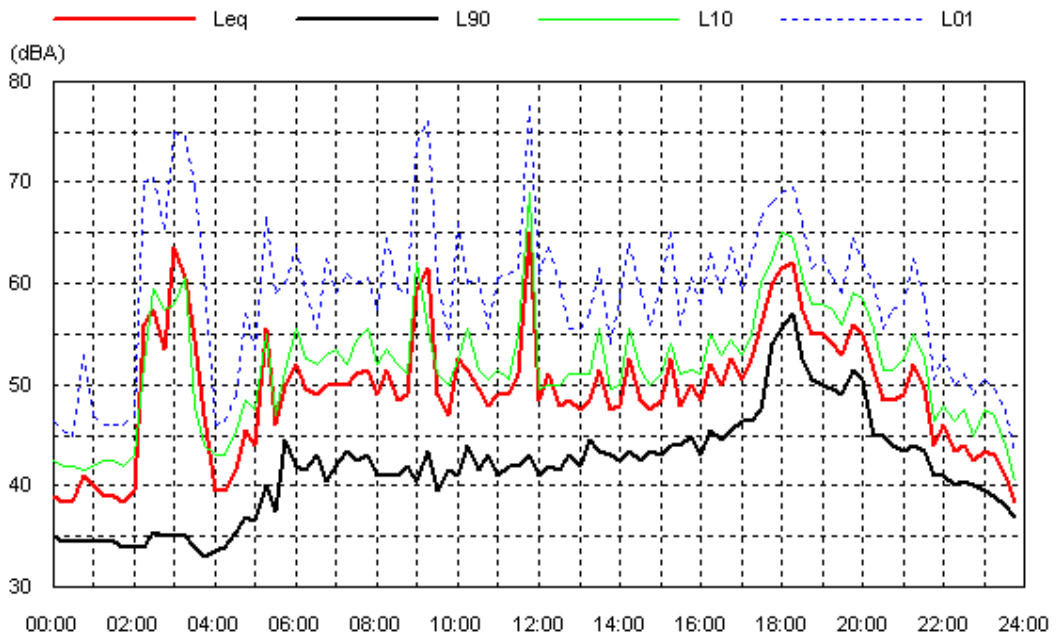
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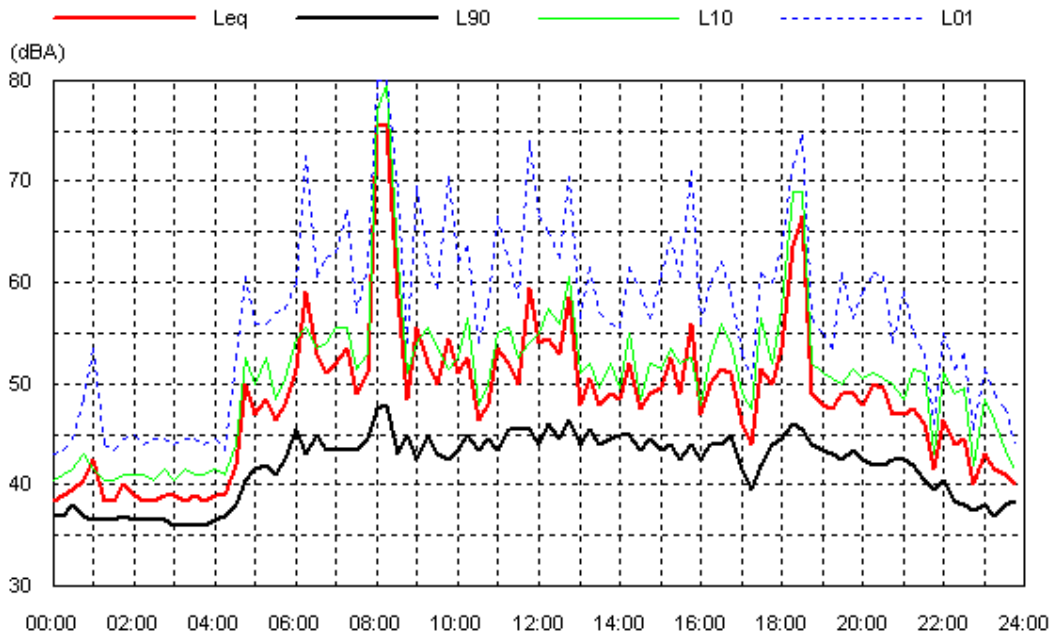
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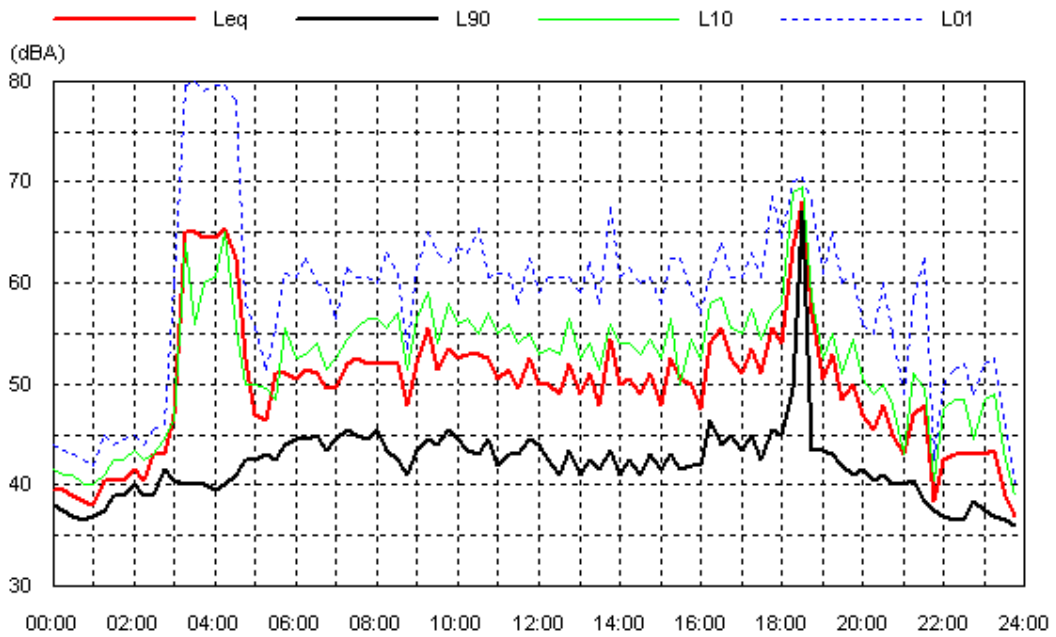
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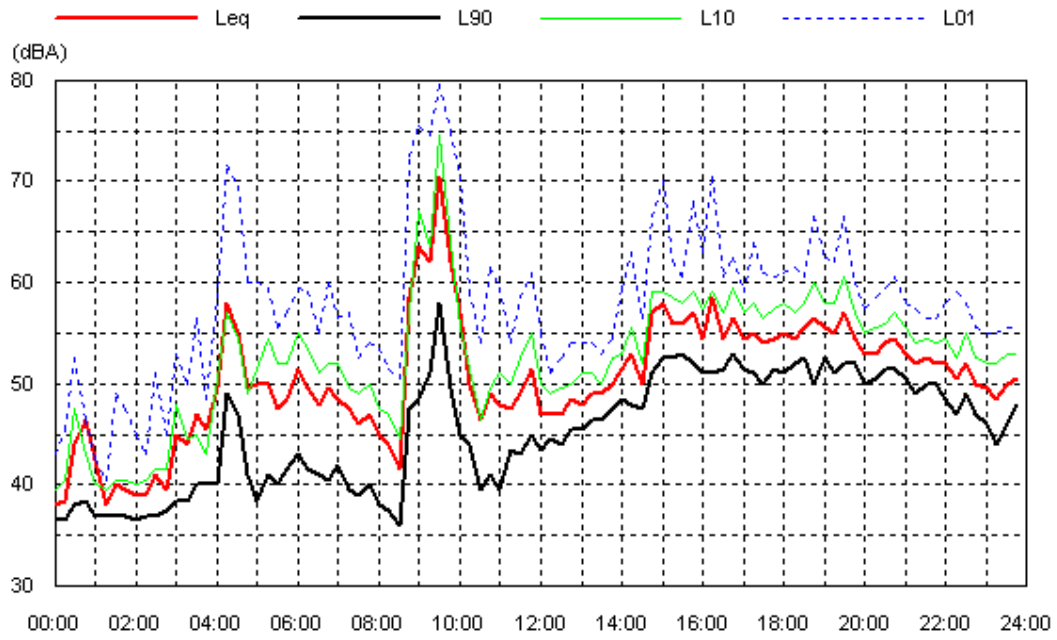
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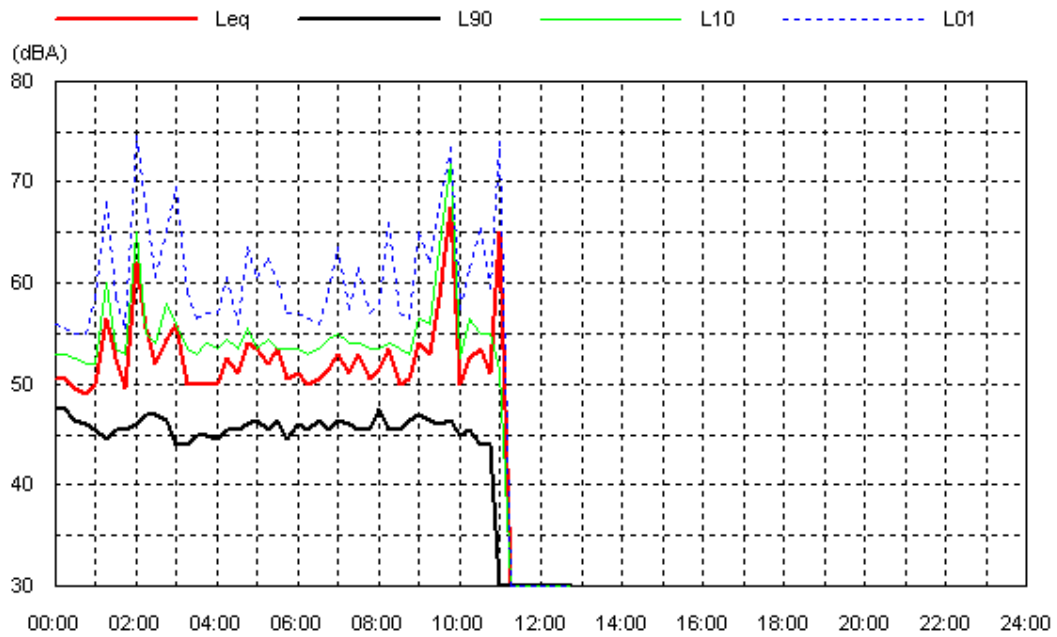
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### Thu 22 Oct 15



### Fri 23 Oct 15



## GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

**Maximum Noise Level ( $L_{Amax}$ )** – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

**$L_{A1}$**  – The  $L_{A1}$  level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the  $L_{A1}$  level for 99% of the time.

**$L_{A10}$**  – The  $L_{A10}$  level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the  $L_{A10}$  level for 90% of the time. The  $L_{A10}$  is a common noise descriptor for environmental noise and road traffic noise.

**$L_{A90}$**  – The  $L_{A90}$  level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the  $L_{A90}$  level for 10% of the time. This measure is commonly referred to as the background noise level.

**$L_{Aeq}$**  – The equivalent continuous sound level ( $L_{Aeq}$ ) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

**ABL** – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10<sup>th</sup> percentile (lowest 10<sup>th</sup> percent) background level ( $L_{A90}$ ) for each period.

**RBL** – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time

