BALTIC 1014 LTD

NOISE ASSESSMENT

LAND BETWEEN NORFOLK STREET & WATKINSON STREET, LIVERPOOL

5 October 2015

AEC REPORT: P3216/R1/DB

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DOCUMENT STATUS

Revision	Date	Document Details	Author	Checked By
Original	5 October 2015	Original	DB	PJK

1.0 INTRODUCTION

1.1 Acoustic & Engineering Consultants Limited (AEC) has been appointed Baltic 1014 Ltd to undertake a noise assessment of the proposed development site between Norfolk Street and Watkinson Street, Liverpool to accompany a planning application for the scheme.

1.2 The scheme is a residential development, consisting of around 200 flats over 12 storeys.

1.3 Acoustic terminology used in this report is presented in brief in Appendix A.

2.0 BACKGROUND AND SITE DESCRIPTION

2.1 A scheme to develop existing wasteland on Norfork Street has been prepared by Falconer Chester Hall architects and the site location is identified on Figure 1. The proposed site layout is identified on Figure 2.

2.2 To the south of the proposed site, on Norfolk Street, lies a multi-storey self-storage building, a vehicle hire depot and offices serving the Queens Docks.

2.3 Chaloner Street (A5036), a five lane dual carriageway, runs along the site to the west. Beyond this are a casino and large hotel, both of which sit beside the Queen's Dock.

2.4 North of the site, on Watkinson Street, is Eyre & Elliston Ltd Electrical Distributors, comprising of a warehouse and small office. Also north of the site is the Golden Dragon ready meal factory, a KFC and a McDonald's fast food restaurant.

3.0 NOISE MEASUREMENTS

3.1 Daytime noise levels were measured by AEC on Wednesday 30 September 2015 between 1000h and 1330h and night-time noise levels were measured on Wednesday 30 September and Thursday 1 October 2015 between 2300h and 0110h.

3.2 Measurements were undertaken at four locations, identified as A to D on Figure 1. Full details of the noise surveys are presented in Appendix B with measured noise data presented in Tables B1 and B2, with a brief description provided below.

3.3 Location A was chosen to represent the western elevation of the development, which would overlook Chaloner Street (A5036) and Queens Docks.

3.4 During the daytime period the road traffic was relatively consistent, with average measured noise levels of 63dB$L_{Aeq,\ 15minute}$ and 66dB$L_{A10,\ 15minute}$. At night the measured ambient noise level due to road traffic ranged from 57 to 59dB$L_{Aeq,\ 10minute}$ with maximum noise levels no greater than 70dBL_{Amax}.

3.5 Location B was selected as being representative of the northern elevation of the proposed building, overlooking Watkinson Street and Chaloner Street at higher elevations.

3.6 The daytime ambient noise levels were consistently around 57dB$L_{Aeq,\ 15minutes}$ in the day due to a combination of plant noise associated with the Golden Dragon factory and road traffic. At night, due to intermittent road traffic on Watkinson Street, the ambient noise level ranged from 52 to 57dB$L_{Aeq,\ 10minute}$. The highest night time maximum noise level at this location was 66dBL_{Amax} due to a car pass by.

3.7 Location C was chosen as a representative location for measuring noise impacting the southern elevation of the proposed building, overlooking Norfolk Street and, at higher elevations, Chaloner Street (A5036).

3.8 The ambient noise level at this location was dominated by road traffic on Chaloner Street with some contribution from the occasional car pass-bys on Norfolk Street, the ambient noise level at this location ranged from 54 to 57dB$L_{Aeq, 15minute}$ in the day and 52 to 54dB$L_{Aeq, 10minute}$ at night. The highest night time maximum noise level was 67dBL_{Amax}, due to a car pass-by on Norfolk Street.

3.9 Location D was selected as being representative of the eastern elevation of the proposed development, overlooking the adjacent carpark, Norfolk Street and Watkinson Street.

3.10 The main noise source at this location during both the day and night-time periods was building services plant serving the Golden Dragon Factory, with road traffic noise also contributing to the overall ambient noise level. During the daytime the ambient noise level ranged from 59 to 62dB$L_{Aeq, 15minute}$ and at night the ambient noise level ranged from 59 to 61dB$L_{Aeq, 10minute}$. During the night-time measurements, it was noted that the building services plant operated intermittently, i.e on for 8 minutes and off for 6 minutes.

3.11 The nearest noise sensitive property to the proposed site is the hotel on Chaloner Street, which is approximately 70m away from the western elevation of the development. The lowest background noise level at Location A, representative of the hotel, during the daytime was 55dB$L_{A90, 15minute}$ and 44dB$L_{A90, 15minute}$ at night.

4.0 BASIS OF ASSESSMENT

Noise Ingress

4.1 Liverpool City Council (LCC) has generally adopted a requirement that the glazing used for residential accommodation in the city centre is as a minimum, 10mm glass/thermal cavity/6mm glass and that habitable rooms are provided with acoustically attenuated mechanical ventilation to remove the need to open windows.

4.2 These proposals are understood to be required to control internal noise levels in habitable rooms to typically no greater than those identified in the World Health Organisation (WHO) document '*Guidelines for Community Noise*'. WHO states that to avoid annoyance and sleep disturbance inside dwellings, the noise level should not exceed 30dB$L_{Aeq, 8 hour}$ and 45dBL_{Amax} at night and between 35dB$L_{Aeq, 16 hour}$ during the day.

4.3 These levels are consistent with those presented in the updated BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings'*, therefore, the internal levels identified by WHO would appear to be appropriate for this type of development.

4.4 The internal levels presented in BS8233 relate to "anonymous noise" i.e. road traffic noise, which does not have a specific acoustic character. In order to reduce the potential impact on sleeping at night and resting, listening and communicating during the day, it is suggested that a -5dB correction is applied to the allowable internal noise levels for rooms affected by the Golden Dragon factory plant. Thus, 30dB$L_{Aeq, 16h}$ in the day and 25dB$L_{Aeq, 8h}$ at night.

4.5 Where these internal noise levels can be achieved with an alternative glazing and ventilation strategy than the one provided above by LCC, the suggested alternative scheme needs to be agreed with LCC.

Noise Egress

4.6 Following discussions with LCC, AEC has been informed that any items of plant associated with the proposed development should be assessed using BS4142: 2014 '*Methods for rating and assessing industrial and commercial sound*', and the 'rating' level should not exceed the existing background at the nearest noise sensitive residential property.

5.0 ASSESSMENT OF PROPOSED DEVELOPMENT

External Envelope Sound Insulation Requirements

5.1 In relation to assessing the daytime ambient and night-time ambient and maximum noise levels on the proposed development, this assessment has looked at 4 different Elevations, as identified on Figure 2. Elevations A to D correspond to the measurement locations A to D.

5.2 Due to the constant nature of the road traffic on Chaloner Street (A5036), it is possible to calculate the daytime ambient noise level ($dBL_{Aeq, 16h}$) on Elevation A using the shortened measurement procedure in CRTN which is based on the measured $L_{A10, 3h}$ of 66dB. To convert $L_{A10, 3h}$ to a daytime average, $L_{A10,18h}$, 1dB is subtracted. To convert this to an ambient noise level, a further 2dB is subtracted, giving overall levels of $63dBL_{Aeq,16h}$ which is similar to the measured short term ambient noise level at this location.

5.3 Due to the nature of the noise sources potentially affecting Elevations B, C and D, the daytime ambient noise level has been based on the typical measured noise level during the measurement period. These levels are presented in Table 1 below.

5.4 At night, although ambient noise levels may reduce after 0100h until about 0500h, the average noise level measured over the two hour period between 2300 and 0100h at each location has been considered representative of the noise climate at each of the elevations A to C and these levels are presented in Table 1. Also provided in Table 1 is the highest measured maximum noise level at night, for all four locations from a typical source i.e car pass-by.

5.5 In relation to the noise levels affecting Elevation D, the main noise source at this location was the building services plant associated with the Golden Dragon factory, however, the ambient night-time noise level was also affected by road traffic on Chaloner Street which will be screened from this elevation following construction of the building.

5.6 Therefore, based on the measured noise levels it has been determined that the operational noise level from the plant only is around 59dBA. Based on the intermittent nature of the plants operation a -3dB correction has been applied due to amount of time the plant operates during any single hour, the corrected night-time ambient noise level of $56dBL_{Aeq, 8h}$ has been used in this assessment and is also presented in Table 1 below.

Table 1 – Typical Noise Levels due to Road Traffic

Elevation	Noise Level, dB		
	Day 0700-2300, $L_{Aeq, 16h}$	Night 2300-0700	
		$L_{Aeq, 8h}$	L_{Amax}
A	63	58	70
B	57	57	66
C	56	54	67
D	61	56	65

Glazing and Ventilation Requirements

5.7 As identified above it is understood that LCC generally require that habitable rooms in residential developments within Liverpool city centre should be provided with 10/TC/6 glazing and mechanical ventilation.

5.8 However, calculations based on the measured external noise levels, the area of glazing (assumed to be 33%) and assumed room dimensions indicate that the internal noise level criterion presented in BS8233 and WHO guidance of $35dBL_{Aeq, 16h}$ in living rooms during the day and $30dBL_{Aeq, 8h}$ and $45dBL_{Amax}$ at night could be achieved with an alternative glazing and ventilation strategy which is presented in Table 2 below.

Table 2 – Outline Requirements to Achieve Internal Noise Levels in Habitable Rooms

Elevation	Room Type	Glazing (Sound Insulation Performance)	Ventilation (Sound Insulation Performance)
A	Living Room	10mm Glass /Thermal Cavity/4mm Glass $36dBR_W$ ($29dBR_w + C_{tr}$)	$33dBD_{n,e,w}$
	Bedroom	10/TC/4 $36dBR_W$ ($29dBR_w + C_{tr}$)	$38dBD_{n,e,w}$
B	Living Room	10/TC/4 $36dBR_W$ ($29dBR_w + C_{tr}$)	$36dBD_{n,e,w}$
	Bedroom	10/TC/4 $36dBR_W$ ($29dBR_w + C_{tr}$)	$33dBD_{n,e,w}$
C	Living Room	4/TC/4 $31dBR_W$ ($25dBR_w + C_{tr}$)	$26dBD_{n,e,w}$
	Bedroom	4/TC/4 $31dBR_W$ ($25dBR_w + C_{tr}$)	$33dBD_{n,e,w}$
D	Living Room	10/TC/6 $38dBR_W$ ($32dBR_w + C_{tr}$)	$33dBD_{n,e,w}$
	Bedroom	10/TC/6 $38dBR_W$ ($32dBR_w + C_{tr}$)	$41dBD_{n,e,w}$

5.9 The glazing and ventilation strategies presented in Table 2 are different from LCC's standard requirement and would, therefore, need to be agreed with the Local Authority in advance.

5.10 Windows can be openable providing that they are effectively acoustically sealed when closed and it is important that any frames and seals do not downgrade the sound insulation performance of the glazing.

5.11 All ventilation requirements have been based on the use of a single vent per room. If more than one unit is required, such as may be required to satisfy Building Control requirements, the performance of each unit might need to increase

5.12 In addition to the above, the suggested glazing and ventilation strategy for Elevation D would also control noise from the Golden Dragon plant to around $30dBL_{Aeq,\ 16h}$ inside living rooms and $25dBL_{Aeq,\ 8h}$ inside bedrooms. This should be acceptable to the Local Authority.

Other Façade Elements

5.13 With regards to the other external façade elements these should be selected in order that the on-site sound insulation performance (dBR'_w) is at least 10dB higher than the performances indicated in Table 2. Therefore, for example, the external envelope on the Elevation D of the proposed development will need to achieve a sound insulation performance of at least $51dBR'_w$.

Plant Noise

5.14 Although it is not yet known what plant is to be associated with this development and where it will be located, control of plant noise at the nearest noise sensitive property on Chaloner Street should not be onerous.

5.15 In order to comply with LLC requirement that the rating noise level does not exceed the background noise level at the nearest properties, a -5dB correction can be applied to the measured day and night-time background noise levels measured on Chaloner Street. Therefore, the noise from all items of plant should be controlled to 50dB during the day and 39dB during the night at the nearest property on Chaloner Street.

5.16 This will need to be assessed further, once the plant has been specified and its final location confirmed.

6.0 CONCLUSION

6.1 Acoustic and Engineering Consultants Limited has been appointed to undertake a noise assessment for the proposed accommodation block on land between Norfolk Street and Watkinson Street, Liverpool.

6.2 Based on the measured noise levels affecting at the proposed development site, the sound insulation requirements to achieve appropriate internal noise levels based on BS8233, WHO guidance has been determined and are presented in Section 5. The proposed glazing and ventilation specification is different from the usual requirement of LCC for all habitable rooms and, would therefore, need to be agreed with LCC.

6.3 Total external noise levels from all future mechanical and electrical plant serving the proposed development should be controlled to 50dBL_{Aeq} during the day and 39dB at nighty at the nearest residential property on Chaloner Street.

6.4 Noise levels at the proposed development have been assessed, and may be controlled through the use of an appropriate sound insulation scheme. Therefore, appropriate planning conditions can be applied to the proposed development to ensure reasonable internal noise levels in the proposed accommodation, and to control noise from any mechanical plant. Based on this, noise should not be considered a determining factor in relation to any planning permission being sought.

Danny Bradley

FIGURE 1 – Proposed Site Location Plan Identifying Monitoring Locations

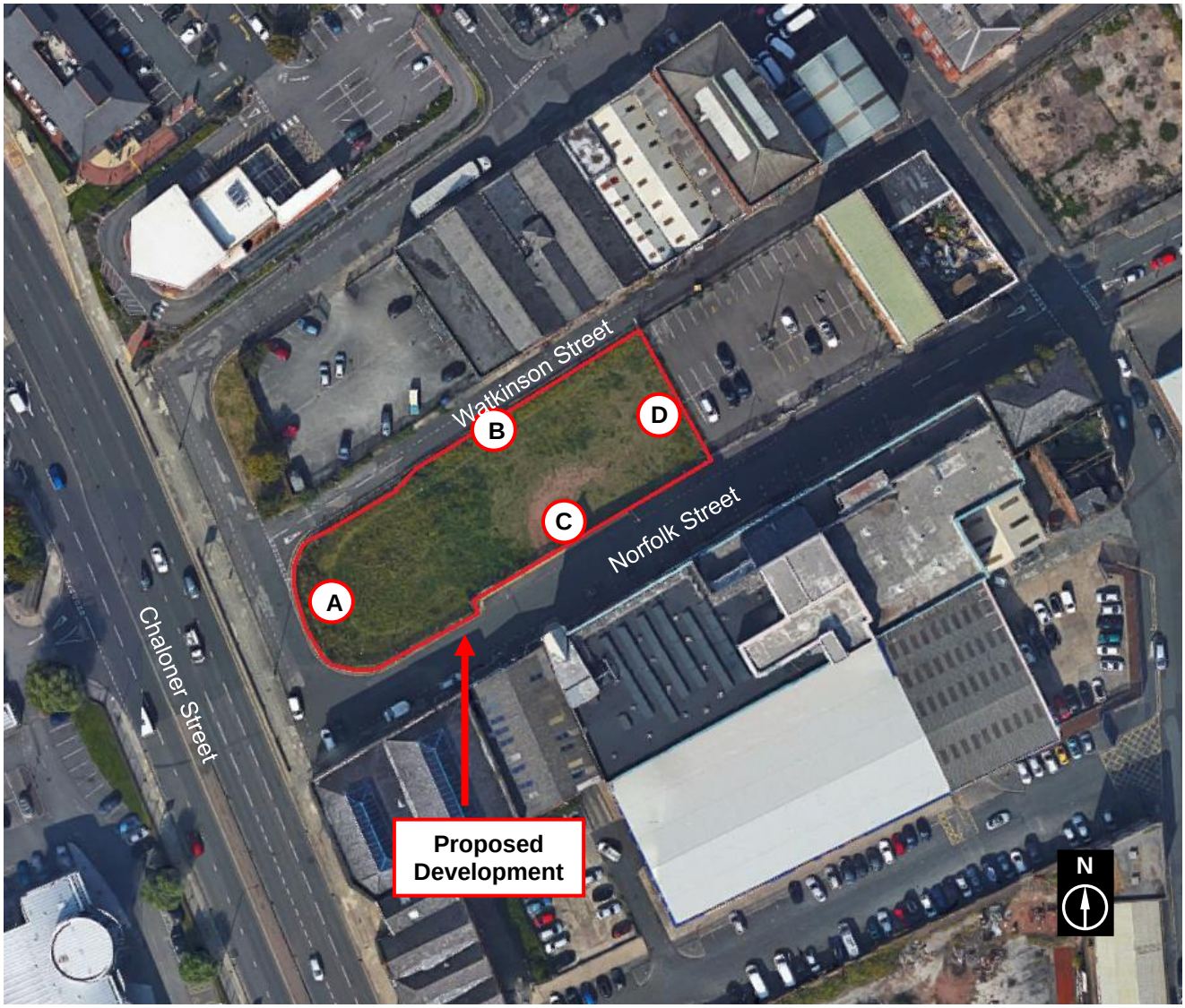
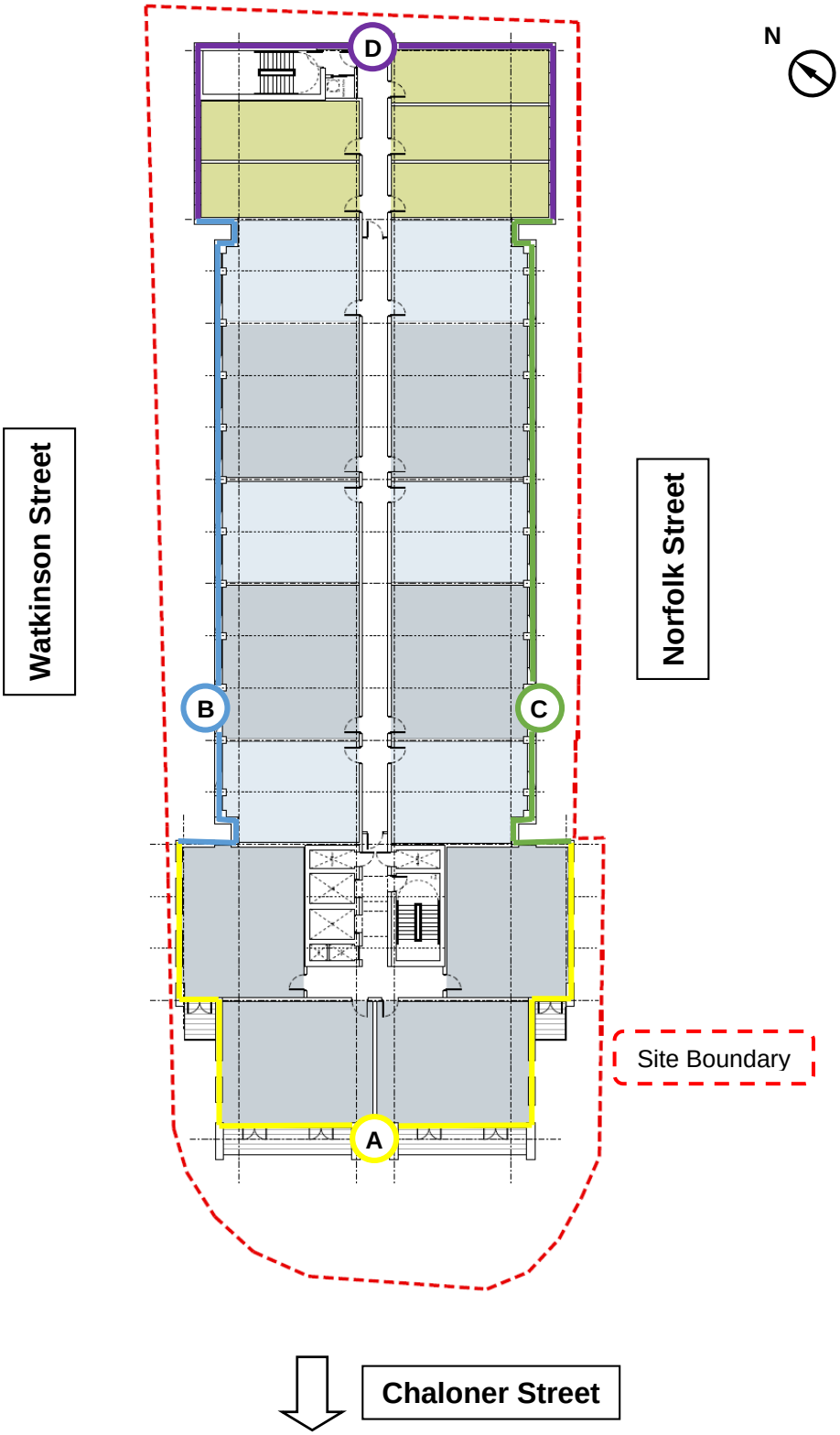


FIGURE 2 – Proposed Site Layout Identifying the Different Elevations



APPENDIX A – Acoustic Terminology in Brief

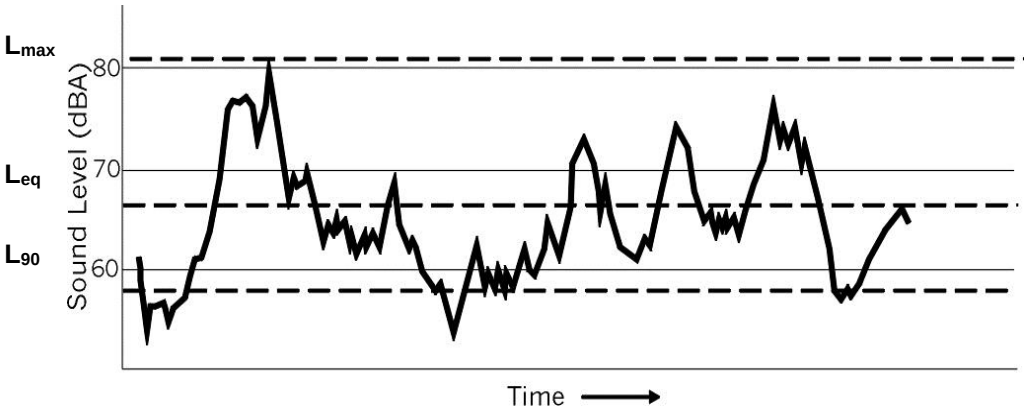
Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz *(Hz)*, that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discreet frequency - a 'pure tone' - most noise is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA,* normally used to assess the effect of noise on people. The dBA weighting emphasises or reduces the importance of certain frequencies within the audible range.

Noise Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the noise.

The figure below shows an example of sound level varying with time. Because of this time variation the same period of noise can be described by several different levels. The most common of these are described below.



Example of Sound Level Varying With Time

$L_{Aeq,T}$ The equivalent continuous (A-weighted) sound level may be considered as the "average" sound level over a given time, T. It is used for assessing noise from various sources including transportation, industrial and construction sources and can be considered as the "ambient" noise level.

L_{A90} The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value used to describe the "background" noise.

L_{Amax} The maximum (A-weighted) sound level during a measurement period.

Free-field Level This refers to the sound level measured outside, away from reflecting surfaces.

APPENDIX B – Measurement Procedure

Dates & Times of Survey	DAY: Thursday 30 September 2015, 1000-1330h. NIGHT: Thursday/Friday 30 September/1 October 2015, 2245-0110h
Personnel Present	Danny Bradley (AEC)
Equipment Used	B&K 2260 Real Time Analyser (AEC Kit 2)
Weather Conditions	DAY: 17^{O}C Dry, clear skies, calm. NIGHT: Dry, 9^{O}C, clear skies, calm.
Measurement Procedure	Ambient, background and maximum noise levels were measured at 4 locations, identified as locations A - D on Figure 1 and described below. A – At the western end of the site, approximately 20m east of Chaloner Street (A5036) and 10m south of Watkinson Street. B – At the northern end of the site, approximately 55m east of Chaloner Street (A5036) and 3m south of Watkinson Street. C – At the southern end of the site, approximately 65m east of Chaloner Street (A5036) and 3m north of Norfolk Street. D – At the southern end of the site, approximately 85m east of Chaloner Street (A5036), 10m north of Norfolk Street and 15m south of Watkinson Street. All locations were selected to measure baseline noise levels, which were measured in terms of L_{Aeq}, L_{A10}, L_{A90} and L_{Amax} (fast response) typically over 10 - 15 minute periods. All the measurements were taken at a height of 1.5m above ground in free-field conditions. The sound level analyser, which conforms to BS EN 61672-12003 *'Electro acoustics – sound level meters - Part1Specifications'* for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.
Measured Data	A summary of the results are presented in Tables B1 and B2.

TABLE B1 – Measured Daytime Noise Levels

Location	Time	Measured Levels (in dB)				Comments
		L_{Aeq}	L_{A10}	L_{A90}	L_{AMax}	
A	1011-1026	63.3	66.6	54.4	71.8	Dominant noise source at this location is road noise from the A5036, with additional contributions from plant noise on Watkinson Street as well as small propeller planes flying overhead and occasional cars on Norfolk Street.
	1116-1131	62.7	65.8	55.6	73.1	
	1235-1250	61.9	65.6	55.6	72.7	
B	1027-1042	56.2	58.6	51.0	72.5	Dominant noise source at this location is plant noise on Watkinson Street and building activities occurring just north east of the site, with contribution from road traffic on the A5036. Additional contributions came from occasional cars on Watkinson Street.
	1132-1147	57.0	59.4	51.8	66.1	
	1251-1306	57.0	58.8	53.8	70.0	
C	1043-1058	54.1	56.6	49.4	68.9	Dominant noise sources at this location are road noise form the A5036, plant noise from Watkinson Street and building works to the north east of the site. Some occasional contribution also from cars on Norfolk Street.
	1148-1203	56.4	58.2	52.8	70.1	
	1324-1339	56.5	58.2	52.8	68.8	
D	1059-1114	62.0	63.4	56.4	69.1	Dominant noise sources at this location were the plant on Watkinson Street, building works from developments to the north east of the site and distant road noise from the A5036.
	1211-1226	59.4	62.8	53.8	65.9	
	1308-1323	59.7	61.8	52.0	66.9	

TABLE B2 – Measured Night-Time Noise Levels

Location	Time	Measured Levels (in dB)				Comments
		L_{Aeq}	L_{A10}	L_{A90}	L_{AMax}	
A	2332-2342	58.5	63.0	45.8	69.8	Dominant noise sources were traffic on the A5036 and plant noise from the building to the north east of the site, with contributions from plant on the casino and occasional passing cars.
	0020-0030	56.7	61.2	43.8	69.1	
B	2258-2308	51.3	54.6	44.6	66.4	Dominant noise sources were plant noise from the building to the north east of the site and traffic on the A5036, with contributions from plant on the casino and occasional passing cars.
	2342-2352	56.7	58.2	54.0	62.1	
	0031-0041	54.0	57.2	43.4	59.3	
C	2321-2331	53.8	55.8	51.2	67.0	Dominant noise sources were plant noise from the building to the north east of the site and traffic on the A5036, with contributions from plant on the casino and occasional passing cars.
	0009-0019	51.9	54.6	42.4	59.0	
	0053-0103	52.2	52.8	49.5	65.9	
D	2309-2319	61.4	62.4	59.8	64.5	Dominant noise source was plant noise from the building to the north east of the site, when the plant was not running, traffic on the A5036 was dominant with contributions from plant on the casino and occasional passing cars.
	2353-0003	58.7	61.8	42.2	64.9	
	0042-0052	59.3	58.8	54.0	65.4	