

Aedas Arts Team

**Burgess Hill Community  
Entertainment and Events Centre**

**Baseline Noise Survey**

265363-00/R01

Issue | 1 March 2019

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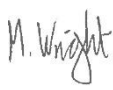
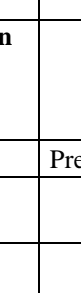
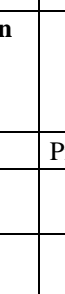
Job number 265363-00

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# Document Verification

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<b>Job title</b>		Burgess Hill Community Entertainment and Events Centre		<b>Job number</b>		265363-00	
<b>Document title</b>		Baseline Noise Survey		<b>File reference</b>			
<b>Document ref</b>		265363-00/R01					
<b>Revision</b>	<b>Date</b>	<b>Filename</b>	20190301 R01 Baseline Noise Survey - Issue.docx				
Issue	1 Mar 2019	<b>Description</b>	Issue				
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		<b>Description</b>					
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# 1 Introduction

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Arup has been appointed by Aedas Arts Team to advise on all design aspects relating to noise and vibration for the proposed Burgess Hill Community Entertainment and Events Centre. The proposed works include demolishing the existing Royal British Legion building on Cyprus Road, Burgess Hill, and building a new community arts venue.

It will be necessary for noise emissions from the development to comply with Mid-Sussex District Council noise policy. Arup has carried out a noise survey to establish baseline noise levels at the existing nearest noise sensitive receivers and at the façade locations of the proposed development. A noise logger was installed on the roof of the adjacent Constitution Club.

This report details the relevant local noise policy and guidance as well as summarising the baseline noise survey. Appendix A contains a glossary of acoustic terminology used within this report.

# 2 Local noise policy

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Arup was advised by Oliver Benson from Mid-Sussex District Council that the following conditions apply to noise from plant and machinery:

*Unless otherwise agreed in writing, noise associated with plant and machinery incorporated within the development shall be controlled such that the Rating Level, measured or calculated at 1-metre from the façade of the nearest existing noise sensitive premises, shall not exceed 5dB below the existing LA90 background noise level. Rating Level and existing background noise levels to be determined as per the guidance provided in BS 4142:2014. Details of any mitigation measures shall be submitted to and approved in writing by the Local Planning Authority. The approved measures shall be implemented before the development is brought into use, and thereafter be maintained in accordance with the approved details.*

Guidance for control of noise from entertainment premises is covered in Sussex Planning Noise Advice Document (March 2013). This states:

- *Where regular use of the proposed premises is planned, any amplified sound (including music and speech), should be inaudible within any nearby noise sensitive premises with or without one or more windows open.*
- *Any other noise sources associated with the premises, such as patron noise, should also be inaudible inside residential properties.*

Inaudibility is a subjective concept which varies from person to person and is not only driven by the level of the entertainment sound breakout but also by the background noise inside the premises. As an appropriate objective target to design to, Arup proposes that the maximum noise level ( $L_{Amax}$  and  $L_{max(63Hz)}$ ) incident on the nearest noise sensitive premises do not exceed the existing background noise levels ( $L_{A90}$  and  $L_{90(63Hz)}$ ) during the hours of operation.

## 3 Baseline noise survey

Arup staff have carried out baseline noise surveys to establish the existing noise levels around the site. Attended measurements took place at locations representative of the nearest noise sensitive receptors during the daytime and evening. Our understanding is that the expected operating hours of the venue would typically be 0900-2300 daily, with very occasional use up to midnight for some functions.

A noise logger was installed on the flat roof of the Constitution Club next-door to the development site, to measure the 24-hour variation in noise levels over a 1-week period.

### 3.1 Details

Dates/Times: 3<sup>rd</sup> December 2018 from 1300 to 2330 (attended)

27<sup>th</sup> November 2018 to 3<sup>rd</sup> December 2018 (unattended)

Personnel: Matt Wright MEng AMIOA

Equipment	Serial	Calibration
Bruel & Kjaer Type 2250 Sound Level Meter	2818092	Date: 12 June 2018 Certificate: CDK1804622
B&K ZC 0032 Preamplifier	17013	
B&K 4189 Microphone	3180873	
B&K 4231 Field Calibrator	3014817	
Rion NL-32	00493038	Date: 05 October 2018 Certificate: UCRT17/1856
Rion NH21 Preamplifier	29980	
Rion UC53A Microphone	315944	
Rion NC74 Field Calibrator	35173566	

Table 1: Measurement equipment

### 3.2 Methodology

The calibration of the sound level meters was checked immediately before and after the survey. No significant fluctuation was noted.

A windshield was fitted over the microphones during all measurement periods to minimise the effects of wind-induced noise.

In all survey locations the sound level meter was mounted on a tripod at a height of 1.5m above local ground level and >3.0m from any other reflecting surfaces, except for the measurements at the façade of the existing Royal British Legion building which were made at 1.0m from the building façade.



A 15-minute measurement period was used for all daytime measurements, whilst a 5-minute measurement period was used for late evening and night-time measurements as well as the logger.

### 3.3 Survey locations

Figure 1 and Table 2 describe the measurement locations as agreed with the Local Authority, and the observed noise climate at each.



Figure 1: Measurement equipment

Location	Photograph	Description
Logger		Free-field location
A		Free-field location Representative of noise levels at the nearest residential properties to the north of the development. The dominant noise source was distant road traffic noise. Distant jet aircraft noise was audible. Maximum noise levels were from cars in the Cyprus Road car park.





Location	Photograph	Description
B		<p>Free-field location</p> <p>Representative of the noise levels at the nearest residential properties to the east of the development on Middle Way.</p> <p>The dominant noise source was distant road traffic noise. Distant jet aircraft noise was audible. Maximum noise levels were from cars in the Cyprus Road car park.</p>
C		<p>Façade location</p> <p>Representative of the noise level at the north façade location of the new development.</p> <p>The dominant noise source was distant road traffic noise. Maximum noise levels were from cars in the Cyprus Road car park. Vehicles on Cyprus road were audible when present.</p>
D		<p>Façade location</p> <p>Representative of the noise level at the south façade location of the new development.</p> <p>The dominant noise source was distant road traffic noise, and vehicles on Cyprus Road when present. The maximum noise levels were from cars and buses on Cyprus Road.</p>
E		<p>Free-field location</p> <p>Representative of the noise levels at the nearest residential receptor east of the development on Cyprus Road.</p> <p>The dominant noise source was distant road traffic noise, and vehicles on Cyprus Road when present. The maximum noise levels were from cars and buses on Cyprus Road.</p>
F	None	<p>Free-field location</p> <p>Representative of the noise levels at the nearest residential receptor west of the development on Cyprus Road.</p> <p>The dominant noise source was distant road traffic noise, and vehicles on Cyprus Road when present. The maximum noise levels were from cars and buses on Cyprus Road.</p>

Table 2: Measurement locations and description of noise

## 4 Results

### 4.1 Attended measurements

One-third octave band noise levels were measured at each location. Table 3 presents a summary of the attended measurement results as A-weighted figures. The background noise levels shown are the lowest measured at each location, whilst the ambient and maximum noise levels are the average values for each location.

Location	Daytime (1300-1630)			Evening (2100-2330)		
	Ambient noise level, dB $L_{Aeq,T}$	Background noise level, dB $L_{A90,T}$	Maximum noise level, dB $L_{Amax,F}$	Ambient noise level, dB $L_{Aeq,T}$	Background noise level, dB $L_{A90,T}$	Maximum noise level, dB $L_{Amax,F}$
A	50	46	68	49	37	68
B	48	46	67	43	38	67
C	49	46	66	N/A	N/A	N/A
D	64	45	80	N/A	N/A	N/A
E	66	49	81	53	34	71
F	N/A	N/A	N/A	53	34	71

Table 3: Summary of measured noise levels at each measurement location

### 4.2 Logger

Table 4 shows the average measured values during each of the time periods shown during the 1-week logging period. Figure 2 shows the variation in noise levels over the 1-week logging period. The noise levels measured during the attended measurements are considered to be typical of the area, and are representative of the noise levels at the nearest noise sensitive receivers during these times.

Time	Ambient noise level, dB $L_{Aeq,T}$	Background noise level, dB $L_{A90,T}$	Maximum noise level, dB $L_{Amax,F}$
Day (0700-1900)	51	49	61
Evening (1900-2300)	50	47	59
Night (2300-0700)	43	40	52

Table 4: Noise logger measured daily average noise levels



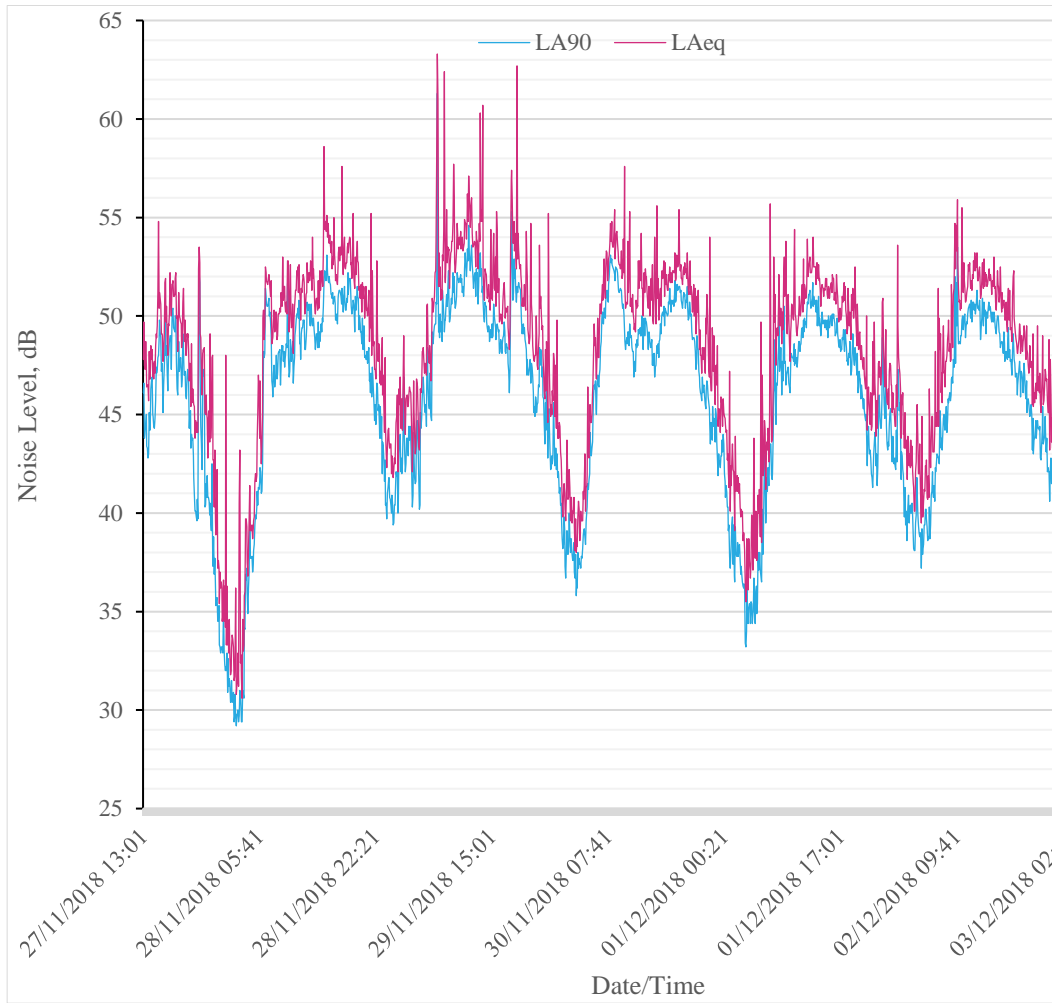


Figure 2: Results of rooftop ambient and background noise measurement over a 1-week period

## 5 Proposed noise emission limits

Based on the Local Authority noise policy outlined in Section 2 and measured noise levels, the following noise emissions limits are proposed for the development.

Noise sensitive receiver	Representative measurement location	Measured Evening Background noise level, dB LA90	Plant noise rating level limit, dB LA,r,Tr	Proposed noise level limit for entertainment use, dB LAmax (dB Lmax(63Hz))
Residential properties 13-23 Cyprus road	E, F	49	44	49 (54)
Residential properties on Middle Way adjacent to Cyprus Road Car Park	B	46	41	46 (53)
Residential property 26 Crescent Road	A	46	41	46 (54)

Table 5 Daytime proposed noise emission limits at nearest noise sensitive receivers (value in brackets for entertainment use refers to 63Hz octave band)

Noise sensitive receiver	Representative measurement location	Measured Evening Background noise level, dB LA90	Plant noise rating level limit, dB LA,r,Tr	Proposed noise level limit for entertainment use, dB LAmax (dB Lmax(63Hz))
Residential properties 13-23 Cyprus road	E, F	34	29	34 (40)
Residential properties on Middle Way adjacent to Cyprus Road Car Park	B	38	33	38 (49)
Residential property 26 Crescent Road	A	37	34	37 (44)

Table 6 Evening proposed noise emission limits at nearest noise sensitive receivers (value in brackets for entertainment use refers to 63Hz octave band)

## 6 Conclusions

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An environmental noise survey has been conducted around the proposed site of the new community centre outside the nearest noise sensitive dwellings. The measured data has been used to establish criteria for noise emission from both building services and events in line with the requirements of the Local Authority. The design of the building services and the building envelope will be developed with appropriate mitigation to allow compliance with these criteria.

## **Appendix A**

### Glossary of Acoustic Terminology

## Decibel

The ratio of sound pressures, which we can hear, is a ratio of  $10^6$  (one million: one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' ( $L_p$ ) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

## dB(A)

The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as  $L_{A10}$ ,  $L_{A90}$ , and  $L_{Aeq}$  for the 'A' weighted equivalent continuous noise level.

## Equivalent Continuous Sound Level

Another index for assessment for overall noise exposure is the equivalent continuous sound level,  $L_{eq}$ . This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

## Statistical Noise Levels

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The  $L_{10}$ , the level exceeded for ten per cent of the time period under consideration, has been adopted in this country for the assessment of road traffic noise. The  $L_{90}$ , the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The  $L_1$ , the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted  $L_{A10}$ ,  $dB_{LA90}$  etc. The reference time period (T), is normally included, e.g.  $dB_{LA10, 5min}$  Or  $dB_{LA90, 8hr}$ .

## Maximum Noise Level

This is generally expressed as the maximum A-weighted noise level ( $L_{Amax}$ ) and represents the maximum instantaneous noise level that occurred with the monitoring period. Certain assessment criteria recommend maximum noise levels to avoid disturbance as well as limits for longer-term averaged noise exposures.

## Minimum Noise Level

This is generally expressed as the minimum A-weighted noise level ( $L_{Amin}$ ) and represents the minimum instantaneous noise level that occurred within the monitoring period. This might be presented together with  $L_{Amax}$  to indicate the full range of noise exposure over the period.

## Frequency

The rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted kHz, e.g. 2kHz = 2000Hz. Human hearing ranges approximately from 20Hz to 20kHz. For design purposes, the octave bands between 63Hz to 8kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.

## Sound Pressure Level

The sound power emitted by a source results in pressure fluctuations in the air, which are heard as sound. The sound pressure level ( $L_p$ ) is 10 times the logarithm of the ratio of the measured sound pressure (detected by a microphone) to the reference level of  $2 \times 10^{-5}$ Pa (the threshold of hearing). Thus  $L_p$  (dB) =  $10 \log (P_1/P_{ref})^2$  where  $P_{ref}$ , the lowest pressure detectable by the ear, is 0.00002 pascals (i.e.  $2 \times 10^{-5}$  Pa). The threshold of hearing is 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dBA or more and a change of 3dB is only just detectable. A change of 10dB is subjectively twice, or half, as loud.

## Typical Noise Levels

Some typical noise levels are given below:

Noise Level, dBA	Example
130	Threshold of pain
120	Jet aircraft take-off at 100m
110	Chain saw at 1m
100	Inside disco
90	Heavy lorries at 5m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)

60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing

## **Appendix B**

### **Attended Measurement Results**



## B1 Attended Measurement Results

Location	Start Time	Duration	Ambient noise level, dB $L_{Aeq,T}$	Maximum noise level, dB $L_{Amax,T}$	Background noise level, dB $L_{A90,T}$	Comments
A	14:15	15min	50	68	46	Distant road traffic noise dominant. Jet aircraft audible. $L_{max}$ levels from vehicles manouvering in Cyprus Road car park
B	14:33	15min	48	67	46	Distant road traffic noise dominant. Jet aircraft audible. Noise from wind in foliage. $L_{max}$ levels from vehicles manouvering in Cyprus Road car park
C	14:50	15min	49	67	46	Façade measurement. Distant road traffic noise dominant. $L_{max}$ levels from vehicles manouvering in Cyprus Road car park
D	15:08	15min	64	80	45	$L_{max}$ from vehicles passing on Cyprus road. Road traffic noise dominant.
E	15:42	5min	66	81	49	$L_{max}$ from vehicles passing on Cyprus road. Road traffic noise dominant.
D	15:59	5min	64	80	46	$L_{max}$ from vehicles passing on Cyprus road. Road traffic noise dominant.
C	16:05	5min	49	65	47	Façade measurement. Distant road traffic noise dominant. $L_{max}$ levels from vehicles manouvering in Cyprus Road car park
A	21:26	5min	44	66	37	Distant road traffic noise dominant. Church bells (continuous) audible. $L_{max}$ levels from music from cars in Cyprus Road car park
E	21:33	5min	60	78	37	$L_{max}$ from vehicles passing on Cyprus road. Road traffic noise dominant. Jet aircraft audible
F	21:41	5min	58	77	36	Distant road traffic noise and plant noise from shopping centre rooftop dominant.
B	21:47	5min	43	63	38	Distant road traffic noise dominant. $L_{max}$ levels from vehicles and people in Cyprus Road car park
A	21:58	5min	54	70	42	Distant road traffic noise dominant. Jet aircraft audible. $L_{max}$ levels from vehicles manouvering in Cyprus Road car park. Car idling in carpark.
E	22:05	5min	60	79	37	$L_{max}$ from vehicles passing on Cyprus road. Road traffic noise dominant.

Location	Start Time	Duration	Ambient noise level, dB $L_{Aeq,T}$	Maximum noise level, dB $L_{Amax,T}$	Background noise level, dB $L_{A90,T}$	Comments
B	22:12	5min	44	71	40	Distant road traffic noise dominant. $L_{max}$ levels from vehicles and people in Cyprus Road car park. Skateboarders in carpark.
E	22:45	5min	39	55	34	$L_{max}$ from vehicles on Crescent way (no vehicles on Cyprus road). Distant road traffic noise dominant.
F	22:52	5min	38	63	33	$L_{max}$ from vehicles on Crescent way (no vehicles on Cyprus road). Distant road traffic noise and shopping centre plant noise dominant. Car idling in Cyprus Road carpark.

Table 7 Attended measurements results summary and observations. Measurements were made in 1/3-octave bands.