

KINGS WHARF, 20-30 KINGS ROAD, READING

PLANNING COMPLIANCE REPORT

Prepared on 01 November 2017

Report 16019.PCR.01.Rev.A

For:

Royal London Mutual Insurance Society Ltd.

55 Gracechurch Street

London EC3V 0UF

Site Address	Report Date	Revision History
Kings Wharf, 20-30 Kings Road, Reading	08/09/2017	Rev.A – 01/11/17

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16019. SP1.Rev.A	Indicative Site Plan
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1.0 INTRODUCTION

KP Acoustics Ltd, Britannia House, 11 Glenthorne Road, London, W6 0LH, has been commissioned by Royal London Mutual Insurance Society Ltd., 55 Gracechurch Street, London, EC3V 0UF to undertake an environmental noise survey at Kings Wharf, 20-30 Kings Road, Reading. The background noise levels measured will be used to determine daytime and night-time noise emission criteria for a proposed plant installation in agreement with the planning requirements of Reading Borough Council.

This report presents the overall methodology and results from the environmental survey followed by calculations to demonstrate the feasibility of a plant installation to satisfy the emissions criterion at the closest noise-sensitive receiver and outline mitigation measures as appropriate.

2.0 ENVIRONMENTAL NOISE SURVEY AND EQUIPMENT

2.1 Procedure

Automated noise monitoring was undertaken at the position shown in Site Plan 16019.SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the nearest noise sensitive receiver relative to the proposed plant installation. Continuous automated monitoring was undertaken for the duration of the survey between 14:15 on 29/06/2017 and 14:15 on 30/06/2017.

The weather during the course of the survey was generally dry with wind speeds within acceptable tolerances and therefore suitable for the measurement of environmental noise. The measurement procedure generally complied with ISO 1996-2:2007 Acoustics *"Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels"*.

2.2 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 957 Class 1 Sound Level Meter
- B&K Type 4231 Class 1 Calibrator

3.0 RESULTS

The results from the continuous noise monitoring are shown as a time history of L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} averaged over 5 minute sample periods in Figure 16019.TH1.

Minimum background noise levels are shown in Table 3.1.

	Minimum background noise level L_{A90} : 5min dB(A)
Daytime (07:00-23:00)	48
Night-time (23:00-07:00)	42

Table 3.1: Minimum measured background noise levels

4.0 NOISE CRITERIA

We would propose to set the noise criteria for the noise emissions of the new plant in this instance, so that the 'A' weighted sound pressure level from the plant, when operating at its noisiest, shall not at any time exceed a value of 10dB below the external background noise, at a point 1 metre outside the window of the closest receiver.

We would therefore propose to set the noise criteria as shown in Table 4.1 in order to comply with the above requirement.

	Daytime (07:00 to 23:00)	Night-time (07:00 to 23:00)
Noise criterion at nearest residential receiver (10dB below minimum L_{A90})	38 dB(A)	32 dB(A)

Table 4.1: Proposed Noise Emissions Criteria

As the proposed units would be used during the daytime period, we would suggest adopting the daytime criterion.

5.0 DISCUSSION

It is understood that the plant installation is comprised of the following unit as shown in 16019.SP1.Rev.A

- 2 No. Daikin RXYSCQ4TV1 VRV condenser units

The closest noise sensitive receiver to the plant location will be a residential window on a property located to the South, at a distance of approximately 19 meters away from the installation location.

The sound pressure levels for the plant units provided by the manufacturer are shown in Table 5.1.

Plant Unit	Sound Pressure level (dB) in Octave frequency bands (Hz)							
	63	125	250	500	1k	2k	4k	8k
Daikin RXYSCQ4TV1 Condenser Unit Sound Pressure Level at 1m	49	53	49	51	46	39	33	24

Table 5.1: Manufacturer's Sound Pressure Level

5.1 Objective overview

As shown in Appendix B and Table 5.2, transmission of noise to the nearest sensitive windows due to the effects of the plant installation fully satisfy the noise emissions criteria without the requirement for any further noise control strategy.

Receiver - Nearest Noise Sensitive Window	Criterion	Noise Level at Receiver from Plant Location (Residential Window)
Operating hours of plant units	32dB(A)	32dB(A)

Table 5.2: Predicted noise level and criterion at nearest noise sensitive location

Furthermore, the value of 32dB (A) is to be considered outside of the building. Windows may be closed or partially closed leading to further attenuation, as follows.

Further calculations have been undertaken to assess whether the noise emissions from the proposed unit installation would be expected to meet the recognised British Standard recommendations, in order to further ensure the amenity of nearby noise sensitive receivers.

British Standard 8233:2014 '*Sound insulation and noise reduction for buildings – Code of Practise*' gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS8233:2014 recommends 30-35dB (A) as internal resting/sleeping conditions.

With calculated external levels of 32 dB (A) the residential window would not need to provide any additional attenuation, in order for 'Good-Reasonable' conditions to be achieved. According to

BS8233:2014, even a partially open window offers 10-15dB attenuation, thus leading to an acceptable interior noise level that meets the criterion.

Receiver	'Good'-'Reasonable' Conditions Design Range – <i>For resting/sleeping conditions in a bedroom, in BS8233:2014</i>	Noise Level outside residential window from Plant Location 1
Inside Nearest Residential Space	30-35 dB(A)	22 dB(A)

Table 5.3: Noise levels and criteria inside nearest residential space

6.0 CONCLUSION

An environmental noise survey has been undertaken at Kings Wharf, 20-30 Kings Road, Reading by KP Acoustics Ltd between 14:15 on 29/06/2017 and 14:15 on 30/06/2017. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant installation.

Calculations show that noise emissions from the plant installation would meet the requirements of Reading Borough Council without the requirement for any further noise control strategy.

Further calculations have been undertaken with regards to the relevant British Standard and it has been ensured that the amenity of nearby noise sensitive receivers will be protected.

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Kings Whard, 20-30 Kings Road, Reading
Environmental Noise Time History
29th June to 30th June 2017

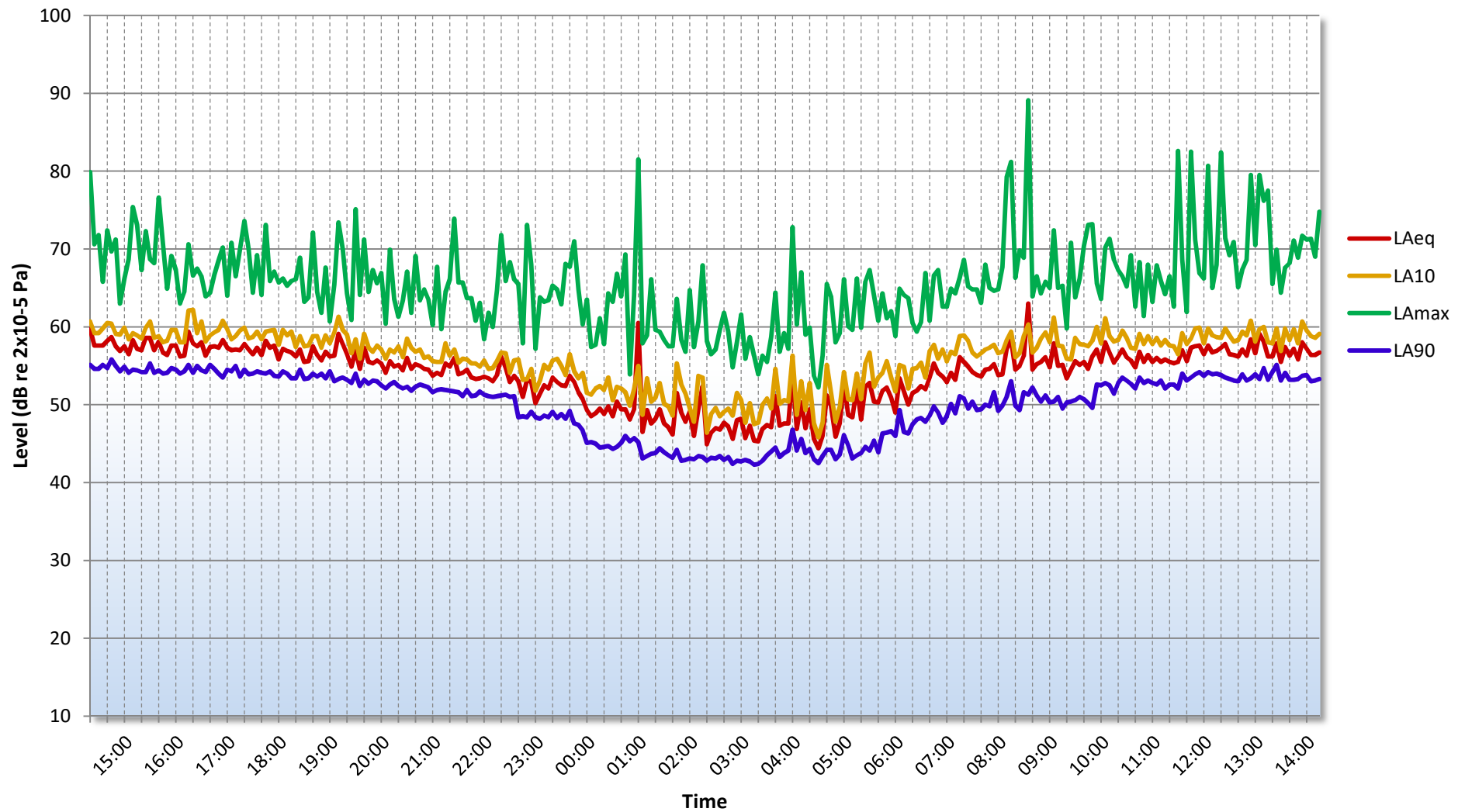
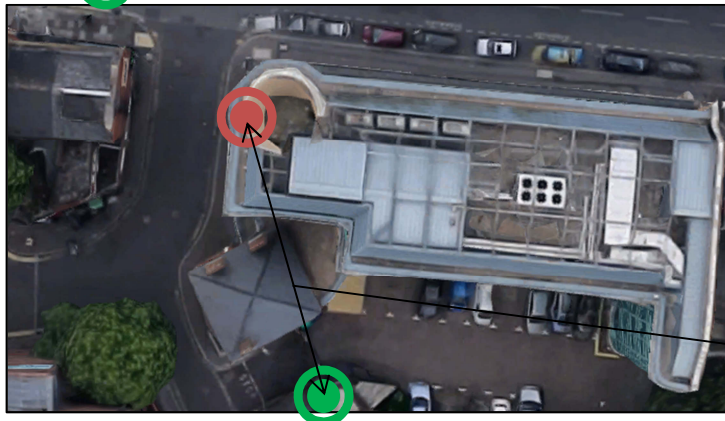
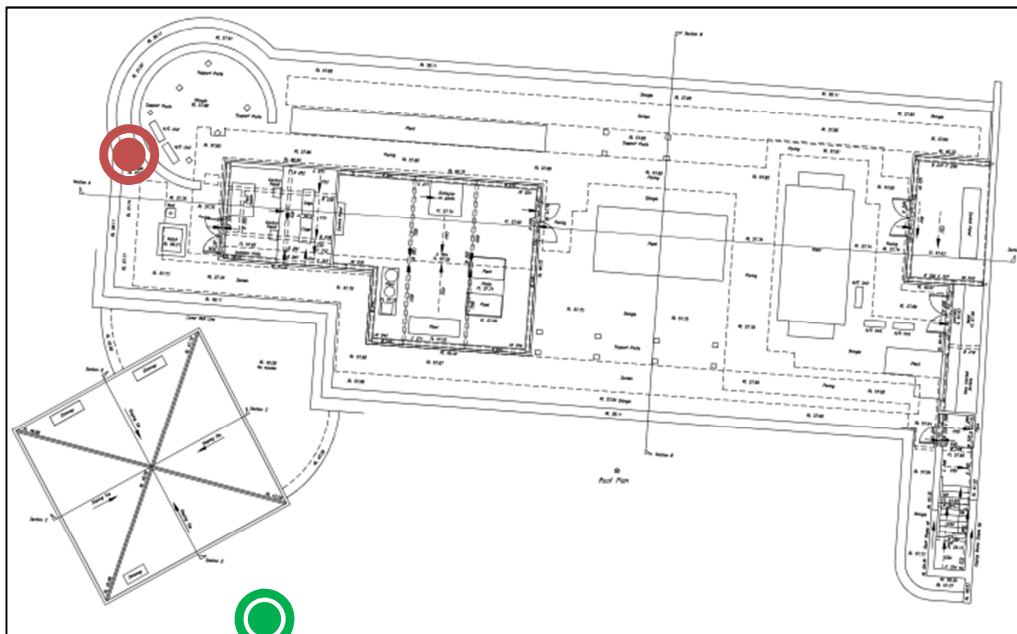


Figure 16019.TH1



Closest residential receiver at a distance of approximately 19 metres



-  Noise Survey Monitoring Position
-  Closest noise-sensitive receiver

Title:

Indicative site plan showing noise monitoring position
(Image Source: Laser Surveys Ltd & JLL, Google Maps)

Date: 01 November 2017

FIGURE 16019.SP1.Rev.A



GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

Receiver: Inside Nearest Residential Window									
Source: Plant Units	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Sound pressure level outside window									32
Minimum attenuation from partially open window, dB									-10
Sound pressure level inside nearest noise sensitive window									22