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Building Services Engineering | Sustainability | Acoustics

Camden Karma Kitchen

LabTech

Kitchen Ventilation Noise Assessment

Revision 1

08/11/2019

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Project Particulars

Client Name: LabTech

Project Name: Camden Karma Kitchen

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Revision History

Revision	Date	Prepared By	Checked By
0	07/11/2019	Jason Clouston BEng MSc MIOA	John Lloyd BEng MSc CEng MIOA MCIBSE
1	08/11/2019	Jason Clouston BEng MSc MIOA	John Lloyd BEng MSc CEng MIOA MCIBSE

Contents

1 Introduction

The proposed development comprises a refurbishment of existing kitchen accommodation located at the sub-basement level of The Triangle Building into new kitchens and ancillary areas.

Mechanical extract ventilation from the kitchens is to be combined into either of two central extract systems, reusing appropriate parts of existing mechanical ventilation plant as far as is practicable. The ventilation plant will be located directly, or ducted to, the rooftop of the Triangle Building.

This document has been prepared by Scotch Partners LLP and presents an assessment of the noise emission from the kitchen ventilation plant, to neighbouring noise sensitive properties.

An external noise survey has been carried at the site to inform the assessment. The findings of the survey are presented within this report.

A glossary containing a selection of the terminology used within this report is included within Appendix A. A selection of the measurement data is presented within Appendix B. Full measurement data from the acoustic surveys are available on request.

2 Background information

2.1 Local Authority

The London Borough of Camden may decide to place a condition on noise emission from the new ventilation plant. The wording of any such condition, based on a similar scheme, is expected to comprise the following:

> *Noise levels at a point 1 metre external to sensitive facades shall be at least 5 dB(A) less than the existing background measurement (LA90), expressed in dBA when all plant / equipment (or any part of it) is in operation unless the plant / equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and / or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels form that piece of plant / equipment at any sensitive façade shall be at least 10 dB(A) below the LA90, expressed in dB(A)..*

Satisfying any such condition can be expected to safeguard the amenities of the neighbouring properties in accordance with the requirements of Policy CS5 of the London Borough of Camden Local Development Framework Core strategy and Policies DP26 and DP28 of the London Borough of Camden Local Development Framework Development Policies.

3 External noise survey

3.1 Description of site

The site to be developed is The Triangle Building which sits to the west of Camden High Street with Camden Lock Place to the south and Gin Alley to the north. There is a railway line in proximity to the site on the northern side of the building. Camden Lock Place to the south provides access to an open courtyard area of Camden Market.

Neighbouring buildings are generally retail or commercial in nature, although it is understood that there are residential properties farther away but in the neighbourhood. Those sensitive neighbours likely to be most exposed to noise from the new ventilation plant are understood to be the Interchange Building directly to the west. Whilst this is understood to be commercial, noise emission levels to the farther away residential buildings can be expected to be less. Therefore, by satisfying the Local Authority requirements to this receiver can also be expected to readily satisfy the same requirement at the farther away residential buildings.

The site is subject to a number of noise sources, including; road traffic on Camden High Street, train movements on the railway directly past the site, activities from patrons using Camden Market and also noise from existing building services on The Triangle Building and other surrounding buildings.

3.2 Measurement methodology

An external noise survey has been carried out at the development site, following the guidance presented within British Standard 7445 *Description and measurement of environmental noise*. Continuous, unattended noise level measurements were recorded at one location.

The microphone was setup on an external balcony of The Triangle Building, at 3rd floor level, with a clear line of sight to the neighbouring Interchange building and the courtyard of Camden Market on Camden Lock Place. The microphone was placed on a tripod about 2m from the balcony floor, and about 1m from the façade of the building. The microphone was therefore considered to be under façade reflected conditions, and a -3 dB correction can be applied to convert the measured data into an approximation of free-field noise levels.

Measurements were recorded between 11:20 on Tuesday 29th and 10:10 on Wednesday 30th October 2019.

Statistical and octave band spectral data were recorded continuously throughout the measurement period in 10-minute samples. The "fast" (125ms) time-weighting was used.

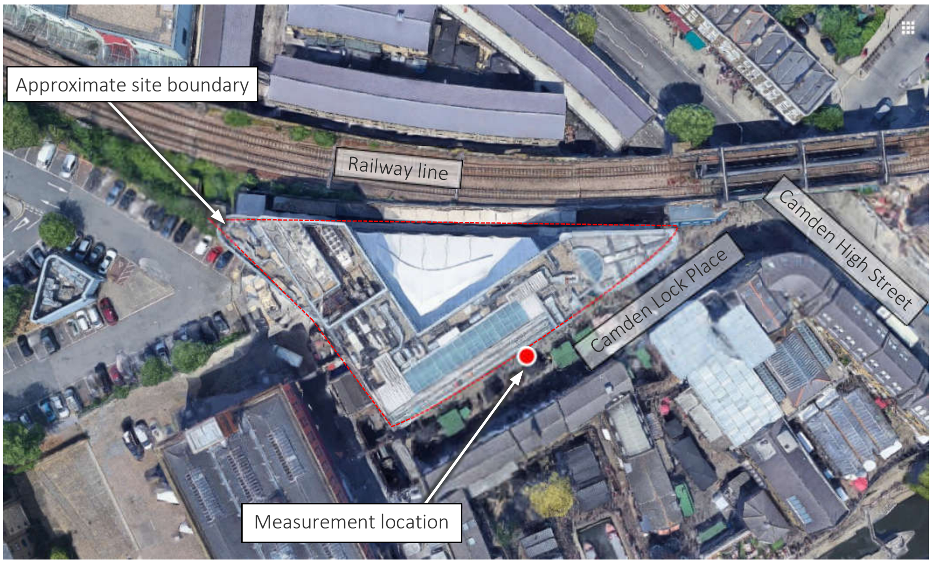

Figure 3-1: External noise survey measurement locations (image courtesy of Google)

The following equipment was used for the noise survey:

Equipment	Type	Serial Number
Norsonic 131	Sound level meter	1313605
Norsonic 1207	Associated pre-amplifier	20032
Norsonic 1227	Associated microphone	170634
Norsonic 1218	Microphone protection system	12182561
Brüel & Kjær 4231	Handheld calibrator	2291098

Table 3.1: Noise measurement equipment

The calibration of the sound level meter and associated microphone was checked prior to and on completion of the measurement period using the handheld calibrator in accordance with recommended practice. No significant drift in calibration occurred during either measurement period. The accuracy of the calibrator can be traced to National Physical Laboratory Standards.

The weather conditions throughout the measurement periods were generally fine and dry with occasional short periods of rain. The weather conditions are not expected to have had a detrimental influence on the survey findings.

3.3 Measurement results

A graph detailing the noise level history at the measurement location throughout the survey are provided in Figure 3-2. Full measurement data are available upon request.

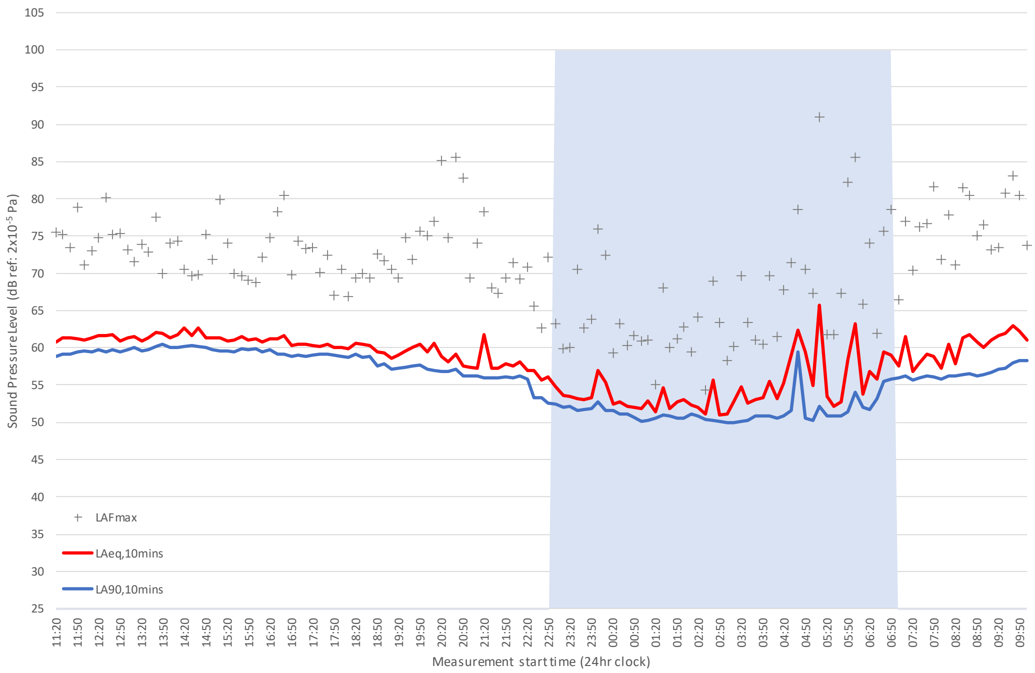

Figure 3-2: Measured noise level history

The assumed lowest background sound levels, based on those measured during the survey, are set down in Table 3.2; These levels are considered to be representative of those likely to be experienced at the façades of the surrounding properties.

Time period	Assumed lowest background noise level
Daytime (07:00-19:00)	56 dB $L_{A90,10min}$
Evening (19:00-23:00)	53 dB $L_{A90,10min}$
Night-time (23:00-07:00)	50 dB $L_{A90,10min}$

All values are sound pressure levels (dB ref: $2x10^{-5}$ Pa)

Table 3.2: Assumed lowest background noise levels

4 Noise emission assessment

4.1 Plant proposals

Detailed design of the new ventilation plant is still to be carried out; including the sizing, layout, and selection of new fans and attenuators (as appropriate). Consideration of suitable noise attenuation measures will need to be given during the detailed design stage to appropriately mitigate levels of noise emission to neighbouring properties. The location of the rooftop plant if shown in Figure 4-1.

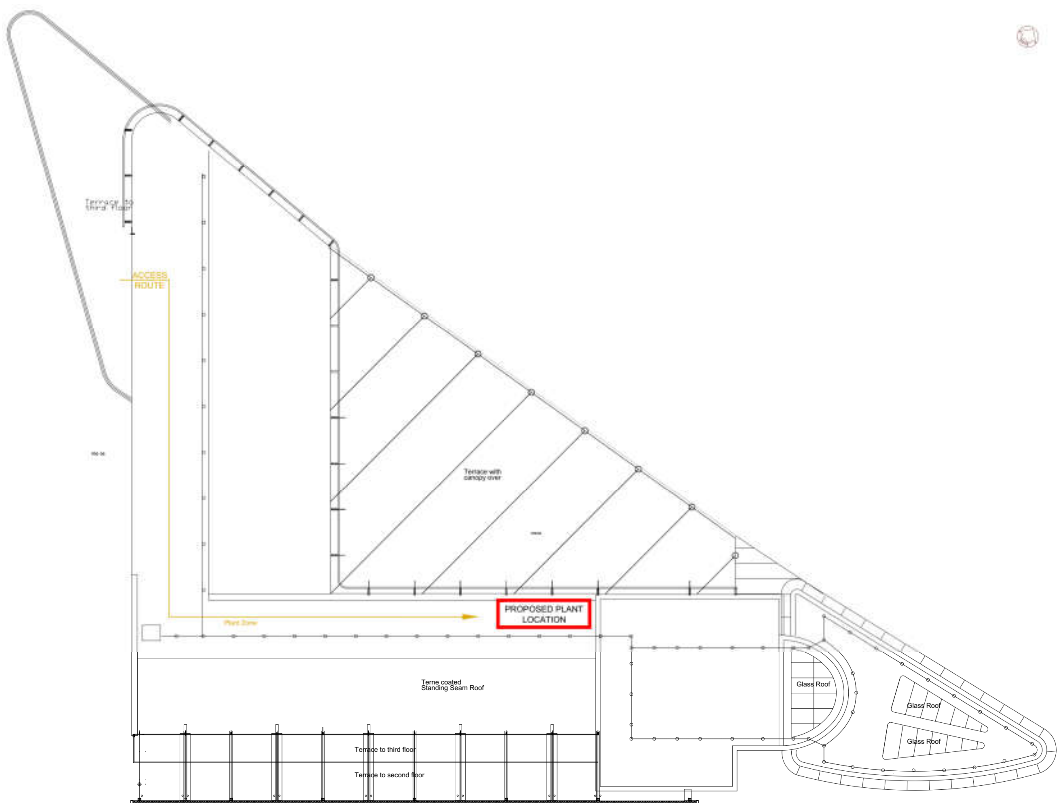

Figure 4-1: Location of rooftop plant

4.2 Nearest noise-sensitive receivers

The assumed nearest noise-sensitive receivers are shown in Figure 4-2Figure 4-1. These are based on inspections at site to establish the nearest and most exposed windows of neighbouring properties.

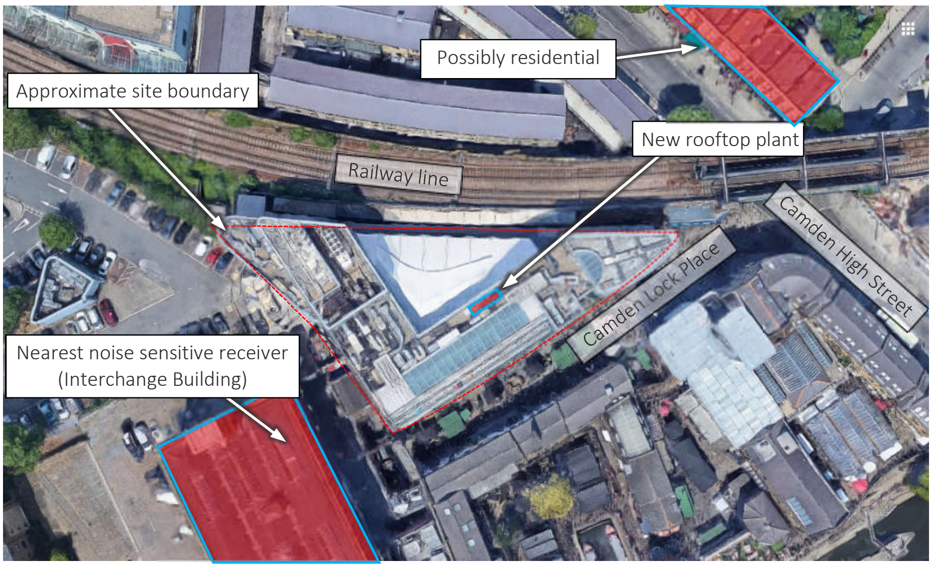

Figure 4-2: Assumed nearest noise sensitive receivers

The approximate distances between the new rooftop plant and nearest noise-sensitive receiver is presented below. Commentary on the amount of acoustic screening between the new plant and receiver is also provided.

- Distance to the windows of the Interchange Building
  - Approximately 35m (c. 31 dB attenuation)
  - New plant will be only partially screened
  - Typically, 5 dB to 10dB attenuation of noise owing to screening effects
  - Total attenuation would therefore be minimum c. 36 dB

4.3 Feasibility check of plant noise emission

Although detailed information on the plant proposals are currently unknown, it is possible to carry out a feasibility check to establish whether plant noise emission is likely satisfy the expectations of the Local Authority.

As noted in Section 2.1, consideration has to be given to any unusual acoustic features that may be present in the equipment noise. If such features are considered to be present, then the noise emission for that piece of equipment would need to be controlled to be 5 dB lower than if such features were not present.

It is considered prudent at this stage to assume that the new plant may feature such character as to attract the 5 dB penalty. Therefore, noise emission from the new plant would need to be controlled to be 10 dBA below the prevailing background noise level (dB L_{A90}) during the time at which the equipment would operate.

Based on the attenuation owing to distance propagation to the nearby noise sensitive receivers (calculated for the worst-case Interchange Building), the attenuation owing to the effects of acoustic screening, and the lowest background sound levels presented in Table 3.2, the following plant noise limits would apply:

- Daytime plant operation
  - Lowest background sound level = 56 dB $L_{A90,10min}$
  - Target of 5 dB below background = 51 dB $L_{A90,10min}$
  - Attenuation owing to distance = 31 dB
  - Attenuation owing to screening = 5 dB
  - Noise character penalty = 5 dB
  - Indicative plant noise emission limit = 82 dB L_{pA}

- Evening plant operation
  - Lowest background sound level = 53 dB $L_{A90,10min}$
  - Target of 5 dB below background = 48 dB $L_{A90,10min}$
  - Attenuation owing to distance = 31 dB
  - Attenuation owing to screening = 5 dB
  - Noise character penalty = 5 dB
  - Indicative plant noise emission limit = 79 dB L_{pA}

- Night-time plant operation
  - Lowest background sound level = 50 dB $L_{A90,10min}$
  - Target of 5 dB below background = 45 dB $L_{A90,10min}$
  - Attenuation owing to distance = 31 dB
  - Attenuation owing to screening = 5 dB
  - Noise character penalty = 5 dB
  - Indicative plant noise emission limit = 76 dB L_{pA}

The indicative plant noise emission limits are presented as the value at a distance of 1m from the external (atmosphere) side connections of the new rooftop plant, and includes the effects of casing radiated noise.

The operating times of the new kitchen ventilation plant are currently unknown, but it can be seen that if plant is to be operated during the evening (19:00 – 23:00) and / or night-time (23:00 – 07:00) hours, then consideration noise emission will need to be more tightly controlled.

The indicative plant noise emission limits are not considered onerous. Based on experience of similar systems, it can be expected that the limits would be readily achievable without any significant acoustic interventions. There may be a need for in-duct attenuators / silencers, particularly if the fans are expected to operate during the evening or night-time periods. The specification of the attenuators (acoustic performance and size) will need to be matched to the sound power levels of the selected fans. From a review of data sheets for typical fans, and an inspection of the rooftop area set aside for new plant, it is considered feasible that suitable attenuation could be installed, should it be considered necessary.

In summary, noise emission from the new fans to neighbouring properties benefits from the effects of large amounts of distance attenuation, and a small to moderate amount of acoustic screening (depending on receiver). The expectations of the Local Authority, in terms of noise control, are expected to be able to be readily satisfied with careful selection of suitable fans, and by providing a reasonable amount of acoustic attenuation if necessary.

Appendix A - Terminology

This appendix provides an explanation of some of the acoustics terms used in this report.

A-weighting L_A or L_{pA}, L_{WA},	The human ear does not sense all frequencies of sound equally. Our sensitivity is at a maximum at around 2 kHz and steadily decreases above and below. Below 20 Hz and above about 20 kHz we can't hear at all. Within its operating limits a precision measurement microphone measures all frequencies the same so the output it produces does not reflect what we would actually hear. The A-weighting is an electronic filter that matches the response of a sound level meter to that of the human ear. When A-weighted the Sound Pressure Level L_p becomes L_{pA} (or L_A) and the Sound Power Level L_W becomes L_{WA}.
L_p L_{pA} (or L_A) L_{AF}, L_{AS}	*The instantaneous sound pressure level* (L_p) *The A-weighted instantaneous sound pressure level* (L_{pA} or L_A) This is the root mean square size of the pressure fluctuations in the air. This level can fluctuate wildly even for seemingly steady sounds. To make sound level meters easier to read the values on the display are smoothed or damped out. This is effectively done by taking a rolling average of the previous 0.125 s (FAST time constant) or the previous 1 s (SLOW time constant). The letters F or S are added to the subscripts in the notation to indicate when the FAST or SLOW time constant has been used. These are often omitted but it is good practice to include them.
L_{max} L_{Amax} L_{AFmax}	*The maximum instantaneous sound pressure level* (L_{max}), *The A-weighted maximum instantaneous sound pressure level (L_{Amax})* *The A-weighted maximum instantaneous sound pressure level with a FAST time constant* (L_{AFmax}).
$L_{N,T}$ $L_{AN,T}$ $L_{AFN,T}$ $_N$ = %age value, 0-100 $_T$ = measurement time eg. L_{A90}, L_{A10}, $L_{AF90,\ 5\ min}$	*The percentage exceedance sound pressure level ($L_{N,T}$),* *The A-weighted percentage exceedance sound pressure level ($L_{AN,T}$), the A-weighted percentage exceedance sound pressure level with a FAST time constant ($L_{AFN,T}$).* This is the sound pressure level exceeded for *N*% of time period *T*. eg. If an A-weighted level of x dB is exceeded for a total of 6 minutes within one hour, the level will have been above x dB for 10% of the measurement period. This is written as $L_{A10,1hr}$ = x dB. L_{A0} (the level exceeded for 0 % of the time) is equivalent to the L_{Amax} and L_{A100} (the level exceeded for 100 % of the time) is equivalent to the L_{Amin}. It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.
$L_{eq,T}$ $L_{Aeq,T}$ $_T$ = measurement time eg. $L_{Aeq,5min}$	The *equivalent continuous sound pressure level over period T ($L_{eq,T}$),* *The A-weighted equivalent continuous sound pressure level over period T ($L_{Aeq,T}$).* This is effectively the average sound pressure level over a given period. As the decibel is a logarithmic quantity the L_{eq} is not a simple arithmetic mean value. The L_{eq} is calculated from the raw sound pressure data. It is not appropriate to include a reference to the FAST and SLOW time constants in the notation

Appendix B - Measurement data

A selection of the measured noise level data are presented in the tables in this appendix. The full set of data are available in electronic form on request.

All values are sound pressure levels in dB re: $2x10^{-5}$Pa.

Table B1: Statistical measurement data

Date & Time	L_{Aeq}	L_{AFmax}	L_{AF10}	L_{A90}
29/10/2019 11:20	60.7	75.5	61.9	58.8
29/10/2019 11:30	61.3	75.2	62.3	59.1
29/10/2019 11:40	61.3	73.5	62.2	59.2
29/10/2019 11:50	61.2	78.8	62.3	59.5
29/10/2019 12:00	61.1	71.1	62.4	59.6
29/10/2019 12:10	61.4	73.0	63.0	59.5
29/10/2019 12:20	61.7	74.7	63.1	59.7
29/10/2019 12:30	61.6	80.1	63.2	59.5
29/10/2019 12:40	61.8	75.2	63.0	59.7
29/10/2019 12:50	60.9	75.3	61.9	59.4
29/10/2019 13:00	61.4	73.2	62.7	59.8
29/10/2019 13:10	61.5	71.6	62.9	60.0
29/10/2019 13:20	60.9	73.9	62.0	59.6
29/10/2019 13:30	61.3	72.9	62.6	59.8
29/10/2019 13:40	62.1	77.5	63.4	60.2
29/10/2019 13:50	62.0	69.9	63.3	60.5
29/10/2019 14:00	61.4	74.0	62.5	60.1
29/10/2019 14:10	61.8	74.4	63.7	60.1
29/10/2019 14:20	62.7	70.6	65.0	60.2
29/10/2019 14:30	61.7	69.7	62.9	60.3
29/10/2019 14:40	62.6	69.8	64.8	60.2
29/10/2019 14:50	61.4	75.2	62.5	60.1
29/10/2019 15:00	61.3	71.8	62.6	59.8
29/10/2019 15:10	61.4	79.9	62.5	59.6
29/10/2019 15:20	60.9	74.0	62.0	59.6
29/10/2019 15:30	61.1	70.0	62.5	59.4
29/10/2019 15:40	61.5	69.6	63.1	59.9
29/10/2019 15:50	61.1	69.1	62.3	59.8
29/10/2019 16:00	61.2	68.8	62.4	59.9
29/10/2019 16:10	60.8	72.2	61.8	59.5
29/10/2019 16:20	61.2	74.8	62.2	59.7
29/10/2019 16:30	61.2	78.2	61.6	59.2
29/10/2019 16:40	61.6	80.5	63.1	59.2
29/10/2019 16:50	60.3	69.8	61.5	58.9
29/10/2019 17:00	60.5	74.4	61.6	59.0
29/10/2019 17:10	60.5	73.3	61.4	58.9
29/10/2019 17:20	60.3	73.5	61.4	59.0
29/10/2019 17:30	60.2	70.1	61.1	59.1
29/10/2019 17:40	60.5	72.4	61.5	59.1
29/10/2019 17:50	60.1	67.0	61.0	59.0
29/10/2019 18:00	60.1	70.6	61.3	58.8
29/10/2019 18:10	59.9	66.9	61.0	58.7
29/10/2019 18:20	60.6	69.3	62.2	59.1
29/10/2019 18:30	60.5	70.0	62.0	58.7
29/10/2019 18:40	60.3	69.3	61.5	58.8
29/10/2019 18:50	59.4	72.6	60.7	57.6
29/10/2019 19:00	59.3	71.7	60.8	57.8
29/10/2019 19:10	58.6	70.6	59.7	57.1
29/10/2019 19:20	59.0	69.3	60.5	57.3
29/10/2019 19:30	59.6	74.7	61.1	57.4
29/10/2019 19:40	60.1	71.9	61.5	57.5
29/10/2019 19:50	60.5	75.6	62.2	57.7
29/10/2019 20:00	59.5	75.0	59.7	57.1
29/10/2019 20:10	60.6	76.9	62.3	56.9
29/10/2019 20:20	58.9	85.1	58.7	56.8
29/10/2019 20:30	58.2	74.8	59.5	56.8
29/10/2019 20:40	59.1	85.5	59.3	57.1
29/10/2019 20:50	57.6	82.8	57.9	56.2
29/10/2019 21:00	57.4	69.3	59.0	56.2
29/10/2019 21:10	57.3	74.0	57.9	56.2
29/10/2019 21:20	61.8	78.2	62.4	56.0
29/10/2019 21:30	57.3	68.0	58.5	56.0
29/10/2019 21:40	57.2	67.4	58.0	56.0
29/10/2019 21:50	57.8	69.4	59.0	56.1
29/10/2019 22:00	57.6	71.4	59.2	56.0
29/10/2019 22:10	58.1	69.2	58.9	56.2
29/10/2019 22:20	56.9	70.8	57.8	55.8
29/10/2019 22:30	57.0	65.6	60.6	53.3
29/10/2019 22:40	55.7	62.7	57.9	53.3
29/10/2019 22:50	56.1	72.2	57.6	52.6

Date & Time	L_{Aeq}	L_{AFmax}	L_{AF10}	L_{A90}
29/10/2019 23:00	54.8	63.2	56.9	52.5
29/10/2019 23:10	53.6	59.9	54.8	52.0
29/10/2019 23:20	53.4	60.1	54.6	52.1
29/10/2019 23:30	53.2	70.5	54.1	51.6
29/10/2019 23:40	53.1	62.7	54.3	51.7
29/10/2019 23:50	53.3	63.8	54.6	51.8
30/10/2019 00:00	57.0	75.9	58.7	52.7
30/10/2019 00:10	55.4	72.5	57.3	51.5
30/10/2019 00:20	52.5	59.3	53.4	51.5
30/10/2019 00:30	52.7	63.2	53.9	51.2
30/10/2019 00:40	52.2	60.3	52.9	51.2
30/10/2019 00:50	52.0	61.6	53.4	50.7
30/10/2019 01:00	51.8	60.9	53.3	50.1
30/10/2019 01:10	52.9	61.0	55.4	50.3
30/10/2019 01:20	51.4	55.1	52.3	50.5
30/10/2019 01:30	54.7	68.1	58.1	51.0
30/10/2019 01:40	51.8	60.1	52.5	50.9
30/10/2019 01:50	52.8	61.2	55.7	50.5
30/10/2019 02:00	53.1	62.8	56.3	50.6
30/10/2019 02:10	52.3	59.5	53.6	51.2
30/10/2019 02:20	52.0	64.1	52.9	50.8
30/10/2019 02:30	51.2	54.4	52.3	50.4
30/10/2019 02:40	55.7	69.0	57.9	50.3
30/10/2019 02:50	51.0	63.4	51.8	50.1
30/10/2019 03:00	51.1	58.3	51.9	49.9
30/10/2019 03:10	52.8	60.2	56.1	50.0
30/10/2019 03:20	54.8	69.6	59.0	50.1
30/10/2019 03:30	52.6	63.4	52.8	50.3
30/10/2019 03:40	53.0	61.1	55.3	50.9
30/10/2019 03:50	53.3	60.4	56.3	50.9
30/10/2019 04:00	55.5	69.6	57.6	50.8
30/10/2019 04:10	53.2	61.5	57.2	50.6
30/10/2019 04:20	55.2	67.7	58.8	50.9
30/10/2019 04:30	59.0	71.4	63.5	51.6
30/10/2019 04:40	62.3	78.6	64.5	59.4
30/10/2019 04:50	59.5	70.6	60.2	50.5
30/10/2019 05:00	54.9	67.4	57.0	50.3
30/10/2019 05:10	65.7	91.0	63.4	52.1
30/10/2019 05:20	53.4	61.8	56.6	50.9
30/10/2019 05:30	52.2	61.8	53.0	50.9
30/10/2019 05:40	52.8	67.4	54.4	50.8
30/10/2019 05:50	58.4	82.2	59.3	51.4
30/10/2019 06:00	63.2	85.5	63.9	54.0
30/10/2019 06:10	53.8	65.9	55.5	52.0
30/10/2019 06:20	56.8	74.0	54.6	51.7
30/10/2019 06:30	55.8	62.0	57.9	53.2
30/10/2019 06:40	59.5	75.7	60.7	55.5
30/10/2019 06:50	59.0	78.6	61.4	55.8
30/10/2019 07:00	57.5	66.4	58.8	56.0
30/10/2019 07:10	61.5	76.9	61.2	56.2
30/10/2019 07:20	56.8	70.4	57.4	55.7
30/10/2019 07:30	58.0	76.2	58.9	56.0
30/10/2019 07:40	59.2	76.6	60.1	56.2
30/10/2019 07:50	58.8	81.6	59.2	56.1
30/10/2019 08:00	57.3	71.9	58.3	55.8
30/10/2019 08:10	60.5	77.8	61.1	56.2
30/10/2019 08:20	57.9	71.1	59.0	56.2
30/10/2019 08:30	61.3	81.5	62.7	56.4
30/10/2019 08:40	61.8	80.5	63.5	56.5
30/10/2019 08:50	60.8	75.0	63.2	56.2
30/10/2019 09:00	60.0	76.5	62.2	56.4
30/10/2019 09:10	61.1	73.2	63.1	56.7
30/10/2019 09:20	61.6	73.5	63.5	57.1
30/10/2019 09:30	61.9	80.8	63.4	57.2
30/10/2019 09:40	63.0	83.1	64.0	58.0
30/10/2019 09:50	62.2	80.5	64.6	58.3
30/10/2019 10:00	61.0	73.7	62.9	58.3

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