Report

Overheating Ventilation Condition Assessment

RIBA Stage 2

Sceaux Gardens

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Introduction

Sweco has been commissioned by Calfordseaden LLP on behalf of Southwark Council to undertake an overheating ventilation condition assessment for the proposed development at at Sceaux Gardens, Southwark SE5.

It is proposed to redevelop part of the existing site at Sceaux Gardens, Southwark SE5 to provide residential accommodation. At present, the site is comprises two residential buildings; Florian block, Racine block, and associated garage facilities, which will be removed under the proposals.

The overheating ventilation condition assessment presented in this report is based on the latest development drawings and the results of the environmental noise survey undertaken on site by Sweco (Formerly MLM Consulting Engineers Ltd) on 2016.

The Report firstly defines appropriate acoustic design standards. It goes on to set out the measured acoustic data and presents the Overheating Ventilation Condition Assessment in relation to the Development. Whilst every effort has been made to ensure that this Report is easily understood, it is technical in nature; a glossary of terms in Appendix A is included to assist the reader.

1 Relevant Standards and Guidance Documents

A summary of the Standards and guidance documents used to inform the Acoustic Design of the scheme is provided below. Further details are provided in Appendix B.

- ANC – Acoustics Ventilation and Overheating – Residential Design Guide.

2 Site Description

2.1 Existing Site

It is proposed to redevelop part of the existing site at Sceaux Gardens, Southwark SE5 to provide residential accommodation. At present, the site is comprises two residential buildings; Florian block, Racine block, and associated garage facilities, which will be removed under the proposals.

The site will be redeveloped into three new residential blocks. The existing blocks on site are identified in Figure 1 below. The current proposed scheme comprises:

- Florian block: 34 residential units;
- Racine block: 23 residential units;
- Garage facility site: 23 residential units.

The proposed development site is located in an urban area. The site surroundings are mainly residential. To the south of the site and immediately to the west of Racine Block is Camberwell College of Arts. The site is bounded by local access streets; Dalwood Street, Sedgmoor Place, Muscatel Place, all with low traffic flows, and in the vicinity of Southampton Way and Peckham Road, the two major streets of the area.

The location and extent of the proposed development site is identified in Figure 1.

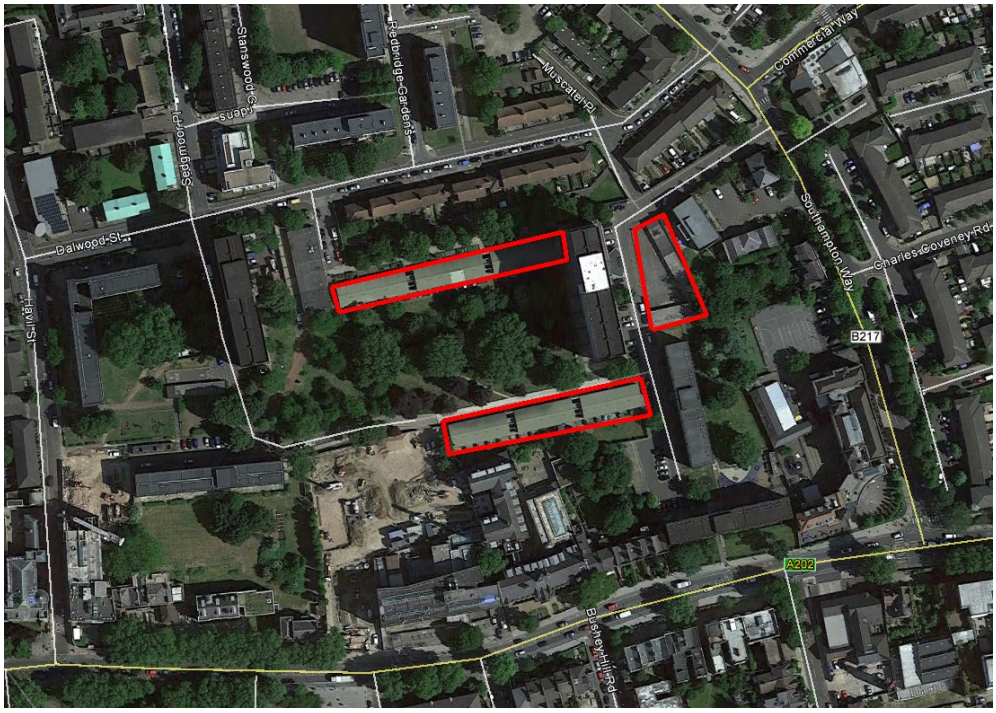
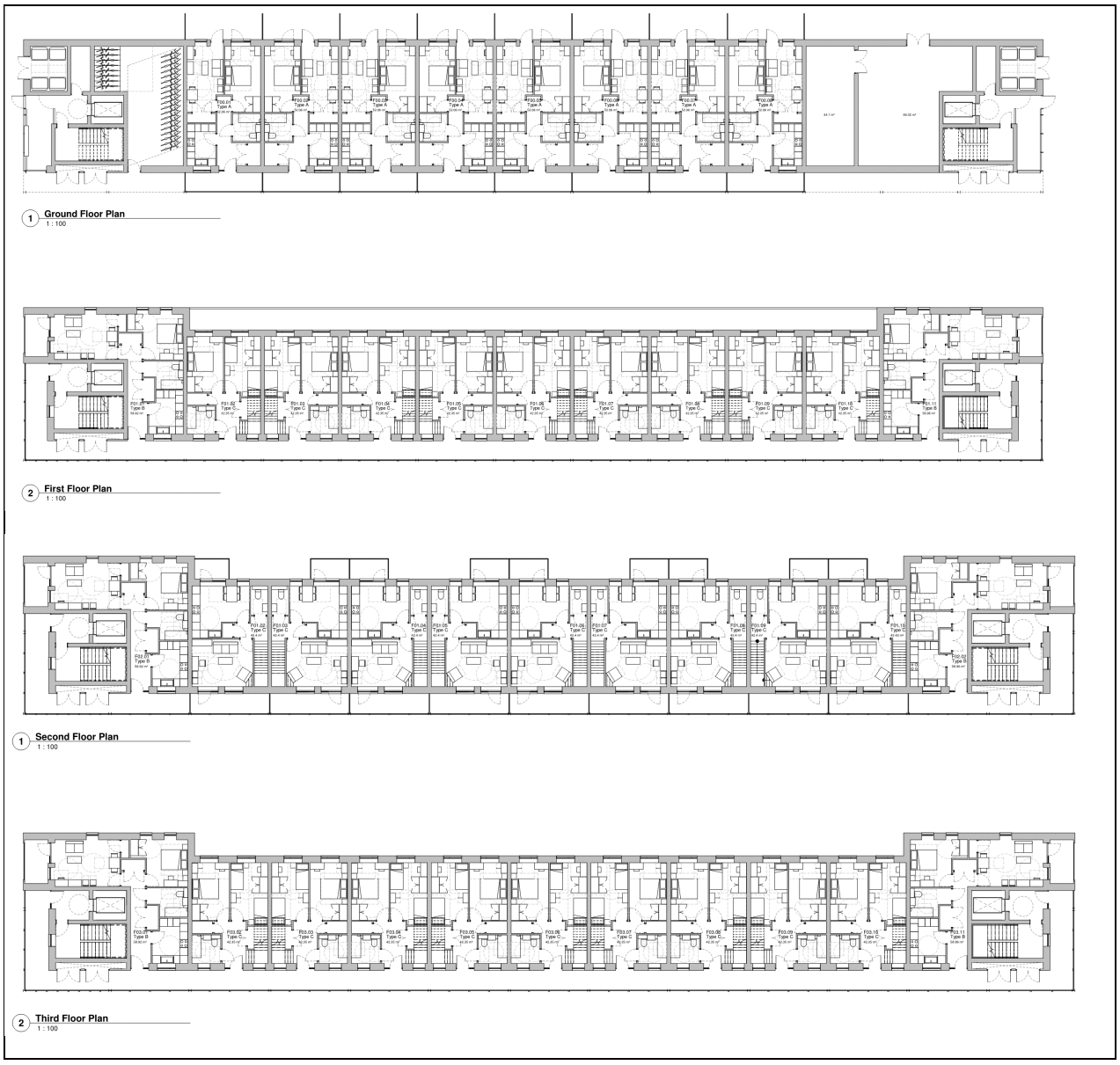


Figure 1 – Site Plan

2.2 Proposed Development

The proposed development is located within an existing residential estate, the noise climate in the area is generally quiet for an urban area, being far from any significant noise source and benefitting from the shape of the existing surrounding residential buildings providing acoustic screening of the noise road traffic noise from the major streets. As such, the environmental noise climate is dominated by distant road traffic noise, noise from aircraft flyover and domestic noise from current tenants.

Figures 2 to 4 below show the layout of the proposed buildings.



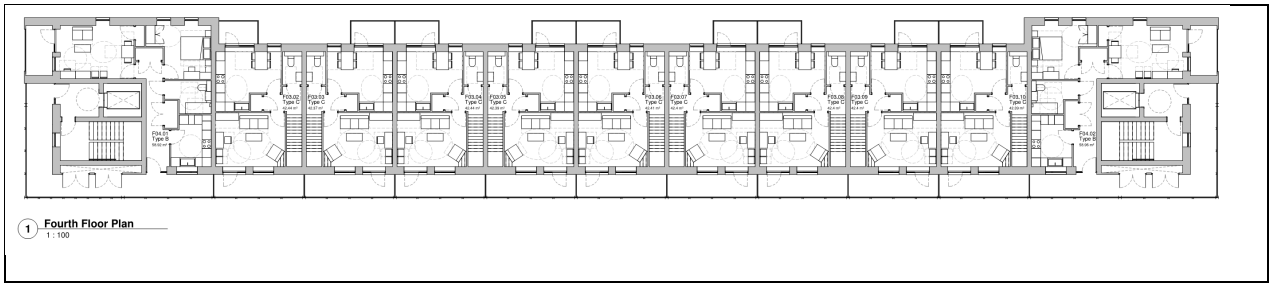


Figure 2 Florian Block – General Arrangement Plans

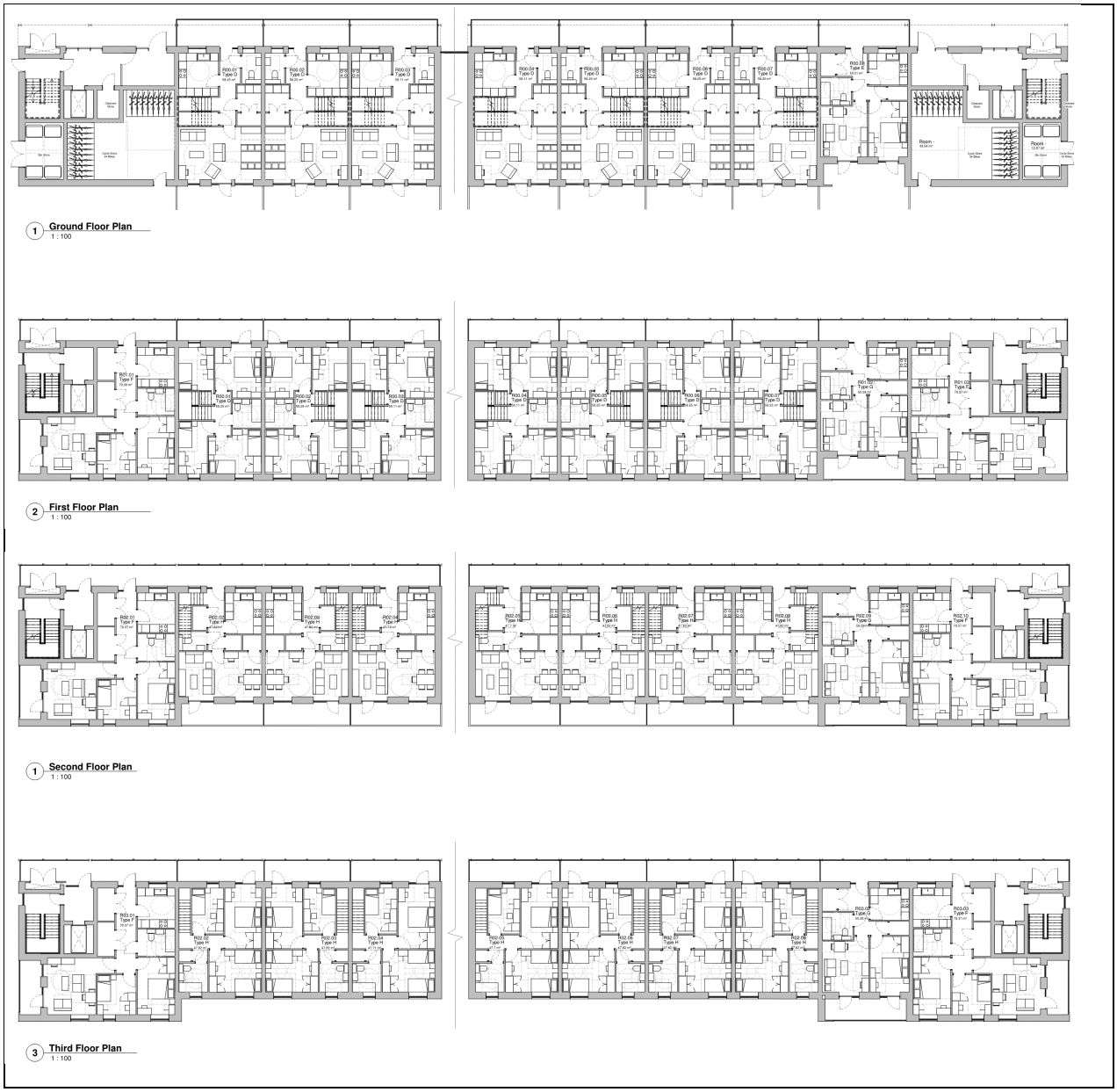


Figure 3 Racine Block – General Arrangement Plans

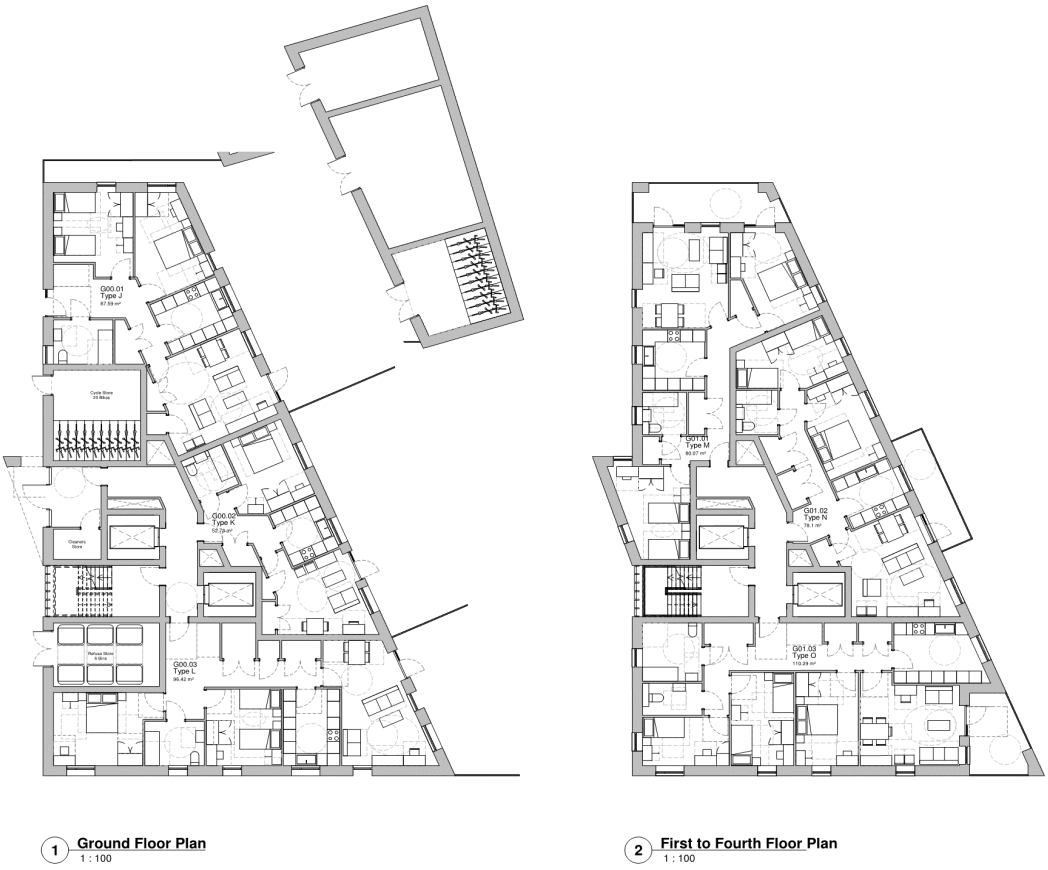


Figure 4 - Garage Block – General Arrangement Plans

3 Baseline Sound Conditions

3.1 Survey Overview

The prevailing noise conditions at the location of the proposed development have been determined by an environmental noise survey. The survey was undertaken over a typical mid-week period between 19 December 2016 and 20 December 2016, at four measurement positions representative of the noise levels within the site.

3.2 Noise Monitoring Methodology

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and in accordance with the principles of BS 7445[1].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of BS 61672[2]. A full inventory of this equipment is shown in table below.

[1] British Standard 7445: 2003: *Description and measurement of environmental noise*. BSI
[2] British Standard 61672: 2003: *Electroacoustics. Sound level meters*. Part 1 *Specifications.* BSI.

Table 1: Inventory of Acoustic Measurement Equipment		
Item	**Manufacturer/Model Type**	**Serial Number**
1-Sound Level Meter	Rion NA-28	00370297
1-Preamplifier	Rion NH-23	60306
1-Microphone	Rion UC-59	00386
Calibrator	Rion NC-74	34315165

The noise measurement equipment used during the surveys was calibrated at the start and end of the measurement period. The calibrator used had itself been calibrated by an accredited calibration laboratory within the twelve months preceding the measurements. No significant drift in calibration was found to have occurred on the sound level meter.

The microphone was fitted with a protective windshield, with an appropriate correction applied on the sound level meter.

3.3 Weather Conditions

Weather conditions were dry with negligible wind during the entire duration of the noise monitoring period.

3.4 Noise Indices

The noise indices measured during the noise survey are shown below:

The equipment was set to record a continuous series of broadband sound pressure levels averaged over 15 minute measurement periods. Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T;
- $L_{Amax,T}$ The A-weighted maximum sound pressure level that occurred during a given measurement period. Measured using the fast time weighting in accordance with the requirements of BS8233:1999;
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background noise level.

The L_{A90} is considered most representative of the background noise level for the purposes of complying with the measurement protocol set out in BS4142:2014.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{Aeq}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445-1:2003 *Description and Measurement of Environmental Noise – Part 1: Guide to Quantities and Procedures*.

3.5 Measurement Details - Procedure and Measurement Positions

With the site being of a residential nature, and having no suitable and safe location for long-term unattended noise monitoring, the survey has been undertaken on the basis of attended spot measurements at a number of locations throughout the site.

Four monitoring positions have been selected on site, being representative of the noise climate at the various façade of the proposed developments. Three sets of 15-minute attended noise measurements has been undertaken within three consecutive hours daytime and three consecutive hours night-time, at each of the four measurement positions. The measurement positions are detailed below and can be seen in Figure 5.

Measurement Position 1:

The sound level meter was located to the north-west of the existing Florian building, within the estate access street, at approximately 15m from Dalwood Street and 15m from Florian building's façade. The microphone was mounted on a 1.5m high tripod, under free field conditions.

This position was selected as being representative of the ambient noise conditions impacting the north-west façade of Florian building and proposed new development.

The noise climate at this position has been found to be dominated by relatively low levels of road traffic noise from Dalwood Street, frequent aircraft flyovers, occasional pedestrians and birdsong. It should be noted that this position was also impacted by noise from temporary works on a nearby construction site during the day; however, periods with significant impact on the measurements have been discarded from the analysis. This position was also impacted by a continuous and distant plant noise from an unidentified equipment associated with the construction site during both daytime and night-time. This noise has been found to be dominating the background noise at this position during night-time.**Measurement Position 2:**

The sound level meter was located within Sceaux Gardens Estate, at the northern corner of the proposed-to-be-demolished garages. This position was facing the access street of the estate and had a direct line of sight with Southampton Way. The microphone was mounted on a tripod, at a height of 1.5m above local ground floor, under free field conditions.

This position was selected as being representative of the ambient noise conditions arising at the proposed development site, at the existing-to-be-demolished garages.

The noise climate at this position was dominated by noise arising from car movements within the estate and along Southampton Way, frequent aircrafts, and pedestrians.

Measurement Position 3:

The sound level meter was located to the south-east of the existing-to-be-replaced Racine building, on an existing car park. The microphone was mounted on a tripod, at a height of 1.5m above local ground floor, under free field conditions.

This position was selected as being representative of the ambient noise conditions arising at the southern façade of the proposed residential development replacing the existing-to-be-demolished Racine building.

Noise climate at this position was dominated by periodic noise associated with Oliver Goldsmith Primary School, mainly with kids being out on the playground, distant noise arising from car movements along Peckham Road, frequent aircrafts, and pedestrians.

Measurement Position 4:

The sound level meter was located approximately 10m from the northern façade of the existing-to-be replaced Racine building, facing Sceaux Gardens landscape. The microphone was mounted on a tripod, at a height of 1.5m above local ground floor, under free field conditions.

This position was selected as being representative of the ambient noise conditions arising within Sceaux Gardens, the northern façade of the proposed development replacing Racing building and the southern façade of the proposed development replacing the existing Florian building.

The noise climate at this position has been found as relatively quiet and was dominated by aircraft flyovers, occasional pedestrians, distant and sporadic road traffic noise as well as distant pitch noise from an unidentified noise source at the nearby Marie Curie building.

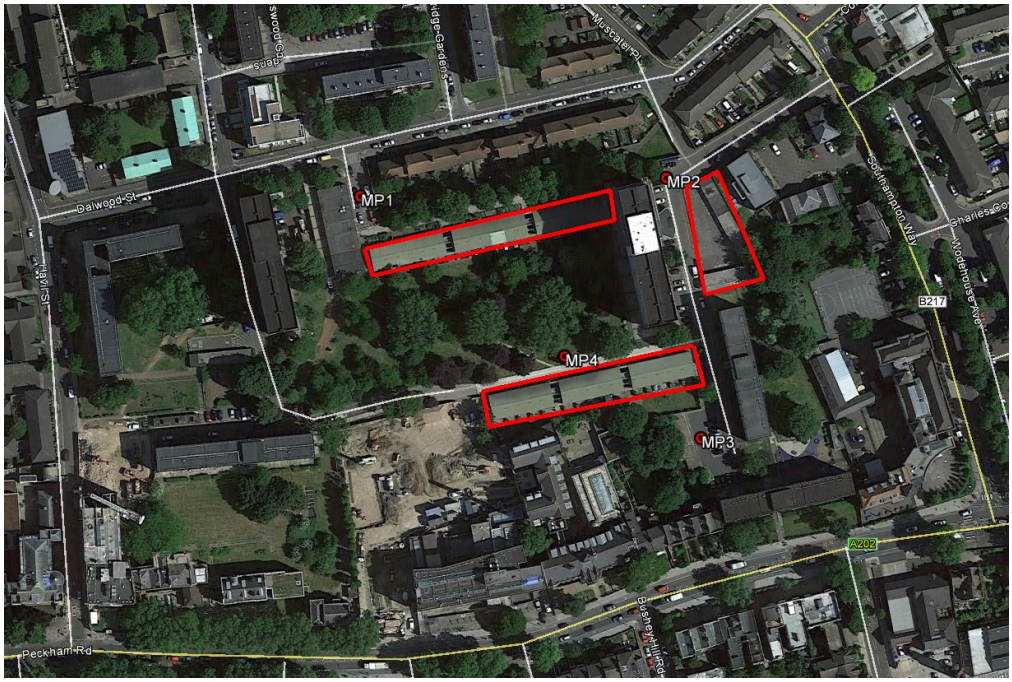


Figure 5 Noise Measurement Positions

3.6 Noise Context

During the entire duration of the monitoring period, the noise climate throughout the site has been found to be largely dominated by noise associated with road traffic on local road network, pedestrians and frequent aircraft flyovers.

The site has been found to be impacted by noise associated with two construction sites located adjacent to the estate. However the measurements have been undertaken with monitoring positions and periods selected to discard any significant impact on the measurements results.

3.7 Noise Survey Results

The results of environmental noise survey are presented in Table 2 below, and are set out in full in Appendix B.

Table 2: Noise Survey Results-dB

Position	Period	Average $L_{Aeq,15min}$	L_{Amax}	Average $L_{A10,15min}$	Minimum $L_{A90,15min}$
MP1	Daytime 14:00-17:00	55.6	74.5	58.3	42.3
	Night-time 04:00-07:00	44.8	70.6	44.7	35.6
MP2	Daytime 14:00-17:00	55.8	73.5	58.1	46.7

Table 2: Noise Survey Results-dB					
Position	**Period**	**Average $L_{Aeq,15min}$**	**L_{Amax}**	**Average $L_{A10,15min}$**	**Minimum $L_{A90,15min}$**
	Night-time 04:00-07:00	46.7	74.4	47.3	36.6
MP3	Daytime 14:00-17:00	52.3	70.8	56.4	42.8
	Night-time 04:00-07:00	45.0	62.8	47.6	35
MP4	Daytime 14:00-17:00	51.8	68.1	54.8	42.8
	Night-time 04:00-07:00	44.2	62.2	45.7	37

4 Overheating Ventilation Condition Assessment

To avoid significant adverse impacts on residents, it should be ensured that apartments do not overheat. Enhanced ventilation rates are often required to mitigate overheating and therefore it is possible that higher noise levels may be experienced in habitable rooms during this ventilation condition.

It should be ensured that noise levels within habitable rooms do not exceed the guideline values from the ANC Acoustics, Ventilation and Overheating (AVO) guidance, whilst mitigation measures to alleviate overheating are active.

An initial risk assessment is provided to determine the risk of adverse noise impact if windows are required to be open to mitigate overheating. The impact of increased noise during the overheating ventilation condition is assessed on a sliding scale depending on the noise level during the ventilation condition, and the period for which the ventilation condition is needed. The Figures below are taken from the AVO guidance and are used to determine the risk of adverse noise impact during the overheating ventilation condition.

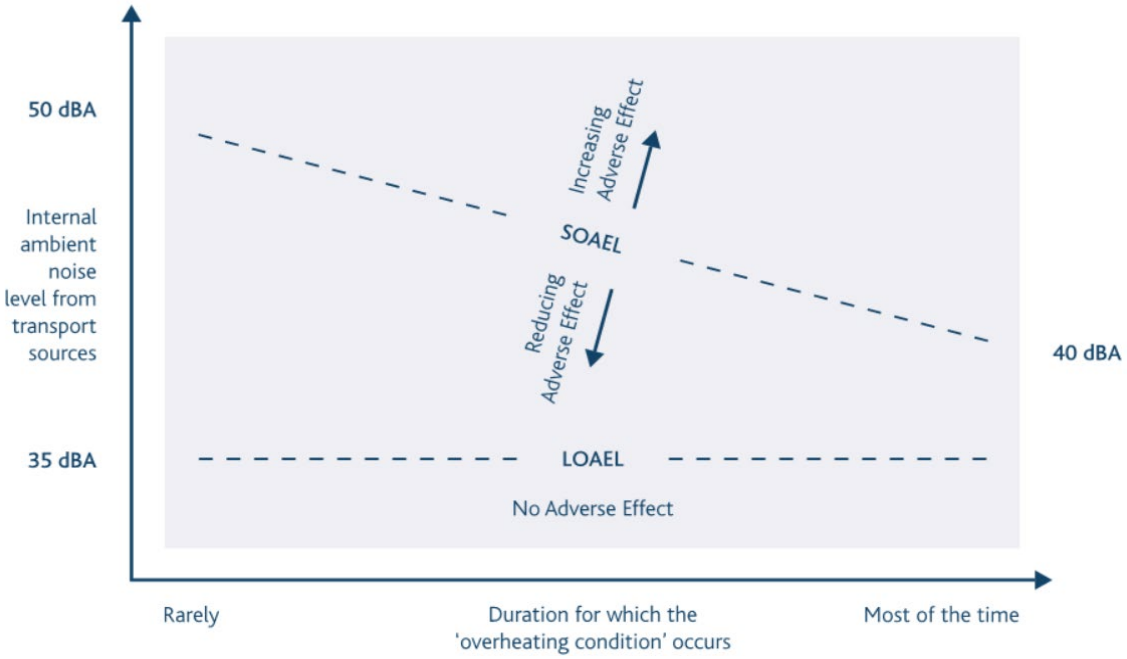


Figure 6 'AVO Diagram' indicating noise levels associated with adverse effects during the daytime

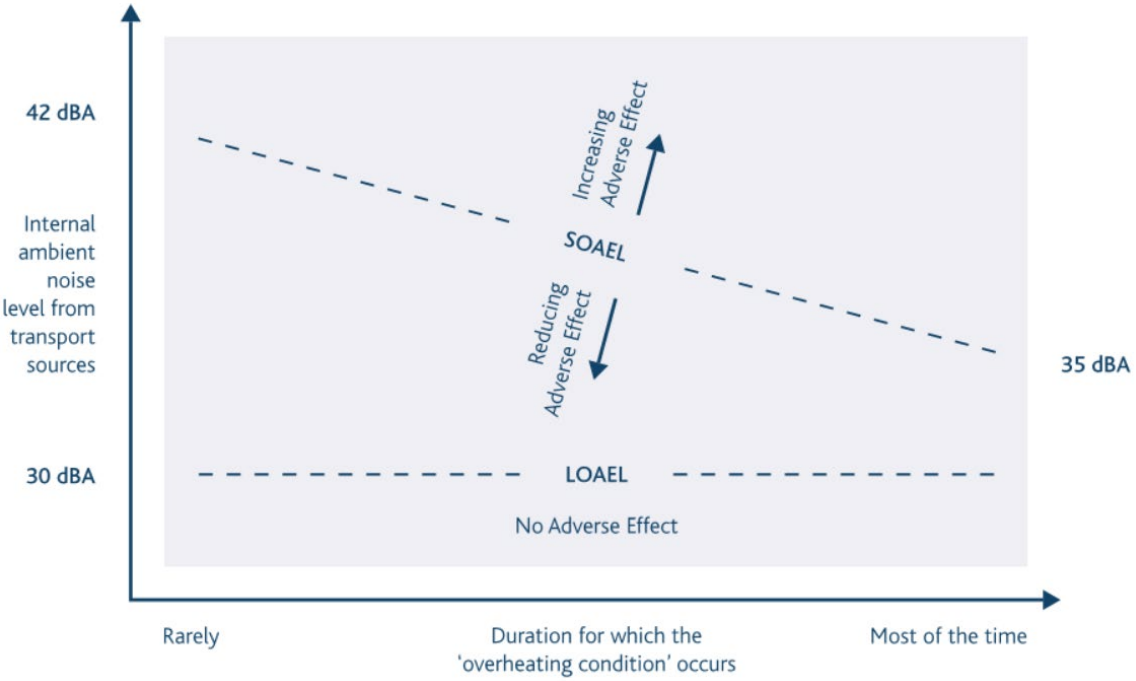


Figure 7'AVO Diagram' indicating noise levels associated with adverse effects during the night time

Based on the predicted façade noise levels, the internal ambient noise levels with partially open windows have been estimated and are presented in Table 3 below.

Table 3: Estimated Internal Ambient Noise Levels with Partially Open Windows

Façade Reference	Façade Description	Period	Predicted External Noise Level, dB	Predicted Internal Ambient Noise Level with Partially Open Windows	Suitability of Using Openable Windows to Mitigate Overheating
1	Florian Block - Northern and Western Facades	Day (07:00 – 23:00)	≤56 $L_{Aeq,16hr}$	43 $L_{Aeq,16hr}$	Can be opened for some of the time to mitigate overheating
		Night (23:00 – 07:00)	≤45 $L_{Aeq,8hr}$ / ≤69 L_{Amax}	32 $L_{Aeq,8hr}$ / 56 L_{Amax}	Can be opened most of the time to mitigate overheating
2	Florian Block - Southern Facades	Day (07:00 – 23:00)	≤52 $L_{Aeq,16hr}$	39 $L_{Aeq,16hr}$	Can be opened most of the time

Table 3: Estimated Internal Ambient Noise Levels with Partially Open Windows					
Façade Reference	**Façade Description**	**Period**	**Predicted External Noise Level, dB**	**Predicted Internal Ambient Noise Level with Partially Open Windows**	**Suitability of Using Openable Windows to Mitigate Overheating**
		Night (23:00 – 07:00)	≤44 $L_{Aeq,8hr}$ / ≤62 L_{Amax}	31 $L_{Aeq,8hr}$ / 49 L_{Amax}	to mitigate overheating
3	Racine Building-All Facades	Day (07:00 – 23:00)	≤52 $L_{Aeq,16hr}$	39 $L_{Aeq,16hr}$	Can be opened most of the time to mitigate overheating
		Night (23:00 – 07:00)	≤45 $L_{Aeq,8hr}$ / ≤63 L_{Amax}	32 $L_{Aeq,8hr}$ / 50 L_{Amax}	
4	Garage Block – Northern and Western Facades – Ground Floor and First Floor	Day (07:00 – 23:00)	≤56 $L_{Aeq,16hr}$	43 $L_{Aeq,16hr}$	Can be opened for some of the time to mitigate overheating
		Night (23:00 – 07:00)	≤47 $L_{Aeq,8hr}$ / ≤72 L_{Amax}	34 $L_{Aeq,8hr}$ / 59 L_{Amax}	Can be opened most of the time to mitigate overheating
5	Garage Block – All Other Facades	Day (07:00 – 23:00)	≤53 $L_{Aeq,16hr}$	40 $L_{Aeq,16hr}$	Can be opened most of the time to mitigate overheating
		Night (23:00 – 07:00)	≤47 $L_{Aeq,8hr}$ / ≤68 L_{Amax}	34 $L_{Aeq,8hr}$ / 55 L_{Amax}	

For the worst affected rooms in Façades 1 and 4, during the daytime period, the use of open windows to mitigate overheating is not expected to cause significant adverse noise impacts if windows provided that windows are only required to be open for some of the time.

The use of open windows to mitigate overheating is not expected to cause significant adverse noise impacts for all other facades even if these are open for longer periods during the daytime or the night time.

A building services engineer will be able to provide an assessment which determines whether enhanced ventilation is required to mitigate overheating and should be consulted if this is a concern.

The findings of this assessment should be reviewed in conjunction with the overheating assessment for the scheme to determine suitability of the proposed overheating mitigation strategy.

6 Conclusion

Sweco has been commissioned by Calfordseaden LLP on behalf of Southwark Council to undertake an overheating ventilation condition assessment for the proposed development at at Sceaux Gardens, Southwark SE5.

For the worst affected facades (Florian Block North and Garage Block West and North), during the daytime period, the use of open windows to mitigate overheating is not expected to cause significant adverse noise impacts provided that windows are only required to be open for some of the time.

The use of open windows to mitigate overheating is not expected to cause significant adverse noise impacts for all other facades even if these are open for longer periods during the daytime or the night time.

The assessment in this report and the overheating assessment produced by the building services engineers should be reviewed in detail by the client to fully evaluate the risks of this design aspect.

Appendix A – Glossary of Acoustic Terminology

Wording	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the Assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in sound, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of

hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A1: Typical Sound Levels Found in the Environment	
Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

Appendix B – Acoustic Criteria

ANC Guidance for Acoustics, Ventilation and Overheating

The Acoustics, Ventilation and Overheating (AVO) guidance provides the following external noise level ranges which identify the risk category for the assessment of noise break-in during the overheating ventilation condition.

Table B.1: AVO Guidance for Level 1 assessment of noise from transport noise sources [Note 1] relating to overheating condition

External Free – Field noise			Examples of Outcomes	Risk category for Level 1 assessment [Note 5]
LAeq,T[Note 3] during 07:00 – 23:00	LAeq,8h during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 [Note 4]		
≤ 53 dB	≤ 48 dB	-	Noise can be heard and causes small changes in behaviour and/or attitude, eg turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in the quality of life.	Low
> 53 dB and ≤ 63 dB	> 48 dB and ≤ 55 dB	Do not normally exceed LAF,max, 78 dB more than 10 times a night	Increasing risk of adverse effect due to impact on reliable speech communication during daytime or sleep disturbance at night. Although noise levels at the lower end of this category will cause changes in behaviour, they may still be considered suitable. Noise levels at the upper end of this category will result in more significant changes in behaviour and are only likely to be considered suitable if they occur for limited periods.	Medium
> 63 dB	> 55 dB	-	The noise causes a material change in behaviour and/or attitude, eg avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	High

Note 1 - The noise levels suggested in Tables 3-2 and 3-3 assume a steady road traffic noise source but may be adapted for other types of transport.

Note 2 - The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships, such as those described in a DEFRA 2014 study [19].

Note 3 - A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines [20].

Note 4 - Refer also to references [1, 16, 17] for further guidance regarding individual noise events.

Note 5 - The risk of an adverse effect occurring will also depend on how frequently and for what duration the mitigation of overheating is likely to result in increased internal noise levels. Refer to Figure 3-2.

…

The AVO guidance also provides risk categories for internal ambient noise levels during the overheating condition as presented below.

Table B.2: AVO Guidance for Level 2 assessment of noise from transport noise sources [Note 1] relating to overheating condition

Internal ambient noise Level [Note 2]			**Examples of Outcomes**	**Risk category for Level 2 assessment [Note 5]**
LAeq,T[Note 3] during 07:00 – 23:00[Note 6]	**LAeq,8h during 23:00 – 07:00**	**Individual noise events during 23:00 – 07:00 [Note 4]**		
≤ 35 dB	≤ 30 dB	Do not normally exceed LAF,max, 48 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	Negligible
> 35dB and ≤ 40 dB	> 30 dB and ≤ 35 dB	-	Noise can be heard and causes small changes in behaviour and/or attitude, eg turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic environment inside the	Low

Table B.2: AVO Guidance for Level 2 assessment of noise from transport noise sources [Note 1] relating to overheating condition				
Internal ambient noise Level [Note 2]			**Examples of Outcomes**	**Risk category for Level 2 assessment [Note 5]**
LAeq,T[Note 3] during 07:00 – 23:00[Note 6]	**LAeq,8h during 23:00 – 07:00**	**Individual noise events during 23:00 – 07:00 [Note 4]**		
			dwelling such that there is a perceived change in the quality of life.	
> 40dB and ≤ 50 dB	> 35 dB and ≤ 42 dB	Do not normally exceed LAF,max, 65 dB more than 10 times a night	Increasing risk of adverse effect due to impact on reliable speech communication during daytime or sleep disturbance at night. Although noise levels at the lower end of this category will cause changes in behaviour, they may still be considered suitable. Noise levels at the upper end of this category will result in more significant changes in behaviour and are only likely to be considered suitable if they occur for limited periods.	Medium
> 50 dB	> 42 dB	-	The noise causes a material change in behaviour and/or attitude, eg avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	High

Note 1 - The noise levels suggested in Tables 3-2 and 3-3 assume a steady road traffic noise source but may be adapted for other types of transport.

Note 2 - The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships such as those described in a DEFRA 2014 study [19]. Internal ambient noise levels would normally be applied to living rooms and bedrooms during the daytime. At night, the levels would normally only be applicable to bedrooms.

Note 3 - A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines.

Note 4 - Refer to references [1, 16, 17] for further guidance regarding individual noise events.

Note 5 - The risk of an adverse effect occurring will also depend on how frequently and for what duration the mitigation of overheating is likely to result in increased internal noise levels. Refer to Figure B.1.

Note 6 - The daytime levels presented in this table may not be appropriate for residential care homes or other situations where conditions for daytime resting are known, at the design stage, to be of particular importance.

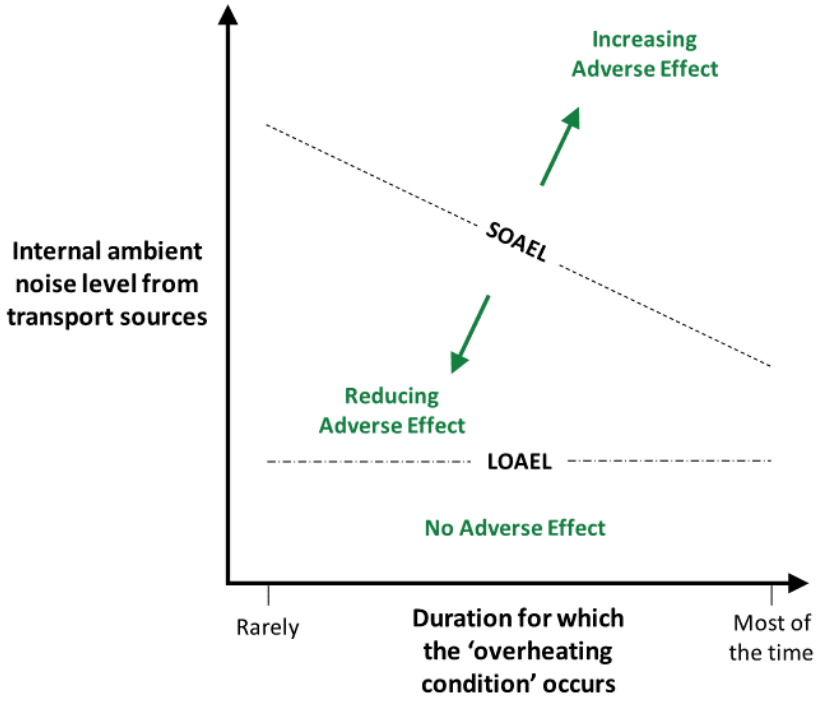


Figure 3-2 Qualitative guidance on combined effect of internal ambient noise level and duration for the overheating situation

…"

The AVO guidance detailed above allows for relaxations in the levels of internal ambient noise level, depending on the amount of time that higher noise levels will be

experienced for. The assessment relies upon data from a TM59 overheating assessment to determine the impact on users in terms of both acoustics and overheating.