

The Printworks, High Road West

Noise Impact Assessment

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1 Introduction

Buro Happold have been commissioned by Goodsynd Tottenham Limited to carry out a Noise & Vibration Assessment (NVA) to support the planning application for a proposed student accommodation development at 819-829 High Road, Tottenham, London (hereafter referred to as "the proposed development", or "the development").

The NVA details the noise impact upon the proposed development from the existing noise climate and the potential operational noise impact upon existing noise-sensitive receptors (NSRs). In summary, the assessment includes the following:

- Description of the proposed development and site
- Acoustic criteria and planning requirements
- Existing baseline conditions at the site and surrounding area
- Potential noise impact upon the proposed development in terms of façade noise-break-in (including commentary on noise during overheating conditions)
- Potential noise impact upon existing NSRs (including activity noise and plant noise emissions)
- Noise mitigation measures such as acoustic façade requirements and limiting noise levels for plant and equipment (where required)
- Conclusions

This report provides commentary on:

- External noise levels (from the survey)
- Results of a 3D computer noise model
- Required performance criteria for internal ambient noise levels (IANL)
- Building layout and ventilation strategy
- Required glazing and ventilation treatments
- Part O: Overheating
- Required maximum permissible noise impact levels for plant/activities
- Local Planning requirements compliance (design stage)

Full planning and listed building consent was granted at the application site in August 2022 (refs. HGY/2021/2283 & HGY/2021/2883) for a residential-led development within a building of similar form and design to that currently proposed.

1.1 Description of Proposed Development and Site

The proposed development is a regeneration of the area that includes demolishing and refurbishing existing buildings and erecting a new building consisting primarily of student accommodation which includes shared amenity spaces, Class E units, landscaping, and car parking.

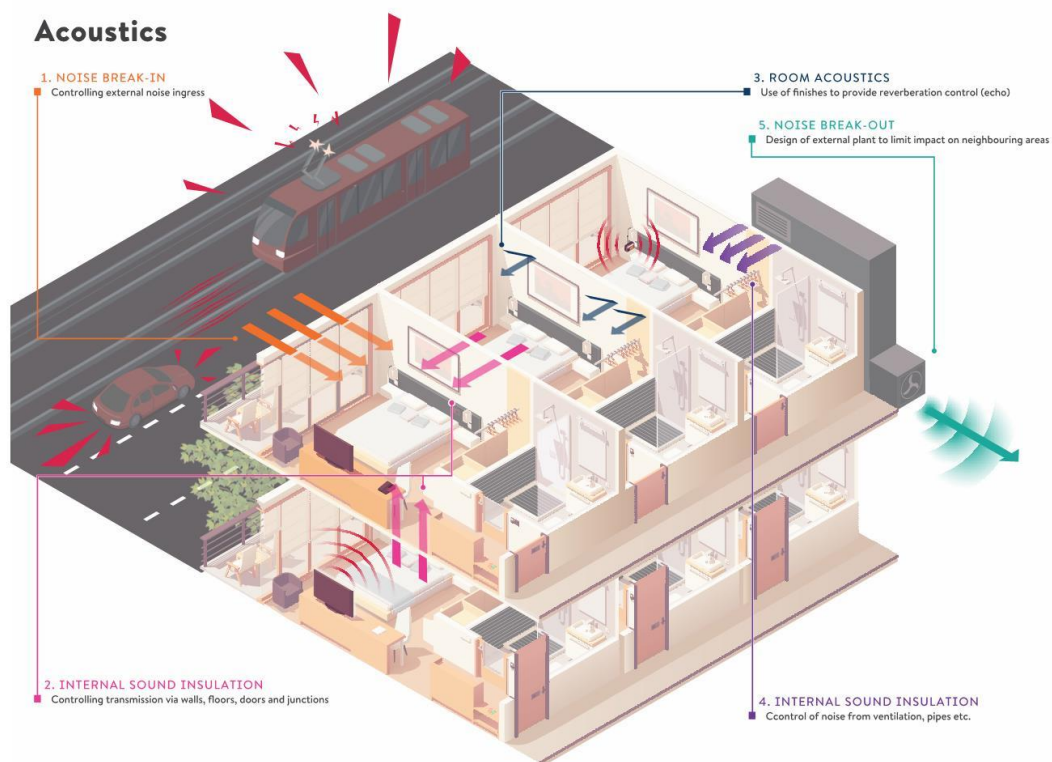


Figure 1—1 The five key elements of building acoustics design

It is understood that the development will including the following:

- The demolition of existing buildings and structures to the rear of 819-829 High Road
- Demolition of 829 High Road
- Internal and external alterations to 819/921 High Road (Grade II)
- The demolition of 829 High Road
- Redevelopment for purpose-built student accommodation and supporting flexible commercial, business and service uses (Class E)
- Hard and soft landscaping, parking, and associated works

The proposed development is to be located at 819-829 High Road, Tottenham, London N17 8ER, which is bound by:

- Brunswick Square to the north
- High Road (A1010) to the east
- Percival Court to the south

An annotated aerial site image is contained in Figure 1—2. High Road and Brunswick square are considered to be the main sources of noise to the north and east, affecting the site, and the rail line to the west.



Figure 1—2 The Printworks model from Revit imposed onto the site in Google Earth.

2 Acoustic Design Criteria

2.1 Introduction

This report makes reference to guidance documents used nationally, regionally, and locally. The adopted design criteria seek to minimise the operational noise impact of the proposed development upon existing noise-sensitive developments and mitigate the environmental noise and vibration impact upon the proposed development. The following sections list the adopted standards and highlights key acoustic and site-specific conditions contained within.

2.2 National Policy and Guidance

2.2.1 The National Planning Policy Framework (NPPF)

The NPPF is the over-arching planning policy document that applies to all new developments in England. The guidance and assessment criteria given (or referred to) in this document can therefore be applied to all other standards in terms of assessing the suitability of granting Planning permission with respect to noise impact.

The NPPF states that Planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of Conditions
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason

2.2.2 The Noise Policy Statement for England (NPSE)

With specific reference to noise impact, the NPPF document refers to the Noise Policy Statement for England (NPSE). The NPSE provides guidance, which enables decisions to be made regarding the acceptable noise burden to place on society, using three key phrases – the No Observed Effect Level (NOEL), the Lowest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL).

In order to provide a consistent frame of reference (and to allow a view to be taken on the suitability of the application with reference to the relevant Planning guidance), the levels or criteria given in other relevant documents used in assessment will be re-framed in terms of the following:

- No Observed Effect Level (NOEL) - The NOEL is the level of noise impact below which no effect can be detected, and there would be no discernible negative effect on health or quality of life.
- Lowest Observed Adverse Effect Level (LOAEL) - The LOAEL is the lowest level of noise impact above which adverse effects on health or quality of life can be detected. Designing noise impacts to be equal-to-or-less-than the LOAEL should see that any adverse effects on health or quality of life are negligible.
- Significant Observed Adverse Effect Level (SOAEL) - The SOAEL is the level above which significant adverse effects on health and quality of life occur. Designs should always seek to avoid a noise impact, which would be categorised as a SOAEL.

2.3 London Policy and Guidance

2.3.1 The London Plan 2021

The London Plan states the following with respect to noise:

Policy D13 Agent of Change

- A. *The Agent of Change principle places the responsibility for mitigating impacts from existing noise and other nuisance-generating activities or uses on the proposed new noise-sensitive development. Boroughs should ensure that Development Plans and planning decisions reflect the Agent of Change principle and take account of existing noise and other nuisance-generating uses in a sensitive manner when new development is proposed nearby.*
- B. *Development should be designed to ensure that established noise and other nuisance-generating uses remain viable and can continue or grow without unreasonable restrictions being placed on them.*
- C. *New noise and other nuisance-generating development proposed close to residential and other noise-sensitive uses should put in place measures to mitigate and manage any noise impacts for neighbouring residents and businesses.*
- D. *Development proposals should manage noise and other potential nuisances by:*
 - 1) *ensuring good design mitigates and minimises existing and potential nuisances generated by existing uses and activities located in the area*
 - 2) *exploring mitigation measures early in the design stage, with necessary and appropriate provisions including ongoing and future management of mitigation measures secured through planning obligations*
 - 3) *separating new noise-sensitive development where possible from existing noise-generating businesses and uses through distance, screening, internal layout, sound-proofing, insulation and other acoustic design measures.*
- E. *Boroughs should not normally permit development proposals that have not clearly demonstrated how noise and other nuisances will be mitigated and managed.*

Policy D14 Noise

In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

- 1. avoiding significant adverse noise impacts on health and quality of life*
- 2. reflecting the Agent of Change principle as set out in Policy D13 Agent of Change*
- 3. mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses*
- 4. improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)*
- 5. separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation*
- 6. where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles*
- 7. promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver. Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations.*

The management of noise is about encouraging the right acoustic environment, both internal and external, in the right place at the right time. This is important to promote good health and a good quality of life within the wider context of achieving sustainable development. The management of noise should be an integral part of development proposals and considered as early as possible.

Managing noise includes improving and enhancing the acoustic environment and promoting appropriate soundscapes. This can mean allowing some places or certain times to become noisier within reason, whilst others become quieter. Consideration of existing noise sensitivity within an area is important to minimise potential conflicts of uses or activities, for example in relation to internationally important nature conservation sites which contain noise sensitive wildlife species, or parks and green spaces affected by traffic noise and pollution. Boroughs, developers, businesses and other stakeholders should work collaboratively to identify the existing noise climate and other noise issues to ensure effective management and mitigation measures are achieved in new development proposals.

The management of noise also includes promoting good acoustic design of the inside of buildings. Section 5 of BS 8223:2014 provides guidance on how best to achieve this. The Institute of Acoustics has produced advice, Pro:PG Planning and Noise (May 2017), that may assist with the implementation of residential developments. BS4214 provides guidance on monitoring noise issues in mixed residential/industrial areas.

2.4 Local Policy and Guidance – Haringey Council

2.4.1 Haringey Development Management DPD adopted July 2017 Policy DM23 Environmental Protection

DM23: Environmental Protection

“Noise pollution can adversely impact on the amenity and health of building occupiers as well as the wider public. The Council will seek to ensure that new developments both minimise noise pollution and appropriately manage its impact. Noise sensitive development (such as housing, schools and health facilities) should be located away or appropriately separated from major sources of noise. The Council will expect that mitigation measures are considered and incorporated into the design process prior to the submission of an application. ”

“The Council will seek to ensure that new noise sensitive development is located away from existing or planned sources of noise pollution. Proposals for potentially noisy development must suitably demonstrate that measures will be implemented to mitigate its impact.”

“A noise assessment will be required to be submitted if the proposed development is a noise sensitive development, or an activity with the potential to generate noise.”

2.4.2 Consultation with the Environmental Health Officer

The Haringey Environmental Health Officer has been contacted on 4 May 2021 and 19 May 2021 via e-mail (see Appendix D) with regards to the assessment methodology and more specifically, the limiting plant noise levels from the Site to existing noise-sensitive receptors.

There has not yet been any response on our proposals therefore plant noise limits will be established within the boundaries set out in the London Plan (Policy D14).

As the previous scheme was found acceptable in terms of the acoustic and noise assessment and design, then the information found in this report should subsequently be found acceptable as there has not been major changes to the massing nor the effects of the development to the noise assessment. The current proposals are similar in form and design to the previous consented scheme.

2.5 Project Specific Acoustic Design Criteria

2.5.1 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings

BS 8233:2014 provides guidance for the control of noise in and around buildings. It is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.

The Standard is also referenced in the London Plan Policy *D14 Noise* as a document that provides guidance on how best to promote good acoustic design inside of buildings.

Acoustic performance design targets can be found in Section 5.2 of this report.

2.5.2 World Health Organisation (WHO) Guidelines for Community Noise

The WHO document provides acoustic design guidelines based on scientific knowledge on the health impacts of community noise. The scope includes a variety of environments from residential living areas to outdoor living areas. These values are adopted in BS 8233:2014. The guidance document also provides commentary of sleep disturbance during night-time sleeping conditions.

Acoustic performance design targets can be found in Section 5.2 of this report.

2.5.3 BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

BS 4142:2014 provides methods for rating and assessing sound of an industrial and/or commercial nature, which includes sound from industrial and manufacturing processes, fixed services plant, sound generated by the loading/unloading of goods and sound from mobile plant / vehicles associated with industrial / commercial premises (e.g. forklift trucks).

The standard will be used in conjunction with the local planning requirements to assess the noise impact of fixed plant items associated with the proposed development. Further details can be found in Section 7 of this report.

3 Environmental Noise Climate

3.1 Introduction

WSP UK Limited undertook an environmental noise and vibration survey as part of a planning application for the first iteration of the proposed scheme. Noise surveys were undertaken in September 2017 and February 2019 at various locations around the development site. Vibration surveys were undertaken directly adjacent to the train line in August 2017 and September 2017.

References to the WSP reports are details below.

Report 1: *WSP UK Limited*

*The Depot, 867 - 879 High Road
Tottenham Noise and Vibration Assessment
October 2019*

Report 2: *WSP UK Limited*

*Goods Yard, White Hart Lane
Environmental Statement, Volume 1*

It should be noted that these noise surveys did not allow for a full noise impact assessment; therefore, supplementary surveys were undertaken by Buro Happold on Thursday, 14 May 2021 to support the planning application.

The existing noise surveys are considered to be representative of the baseline conditions of the Site, therefore no additional have been undertaken for this addendum.

The purpose of the surveys is to:

- Capture the existing ambient noise level and assess the incident façade noise level across the proposed scheme. The values will be used to calculate the sound insulation requirements of the façade such that the acceptable internal ambient noise levels can be achieved within habitable areas
- Capture the existing typical background noise level and define the limiting plant noise levels for mechanical plant and equipment serving the scheme. The plant noise limits should see that plant noise emissions should not have an adverse impact upon nearby noise sensitive receivers

The existing surveys have been used in this assessment for the following reasons:

- The survey positions are suitable to the proposed red line boundary;
- The noise and vibration survey was carried out pre-COVID (late 2017 & early 2019), meaning the noise levels are considered to be representative of the pre-COVID noise climate, where daily commuting levels were higher due to minimal working-from-home/hybrid working work policies; and
- Given the similarities with the previous planning application, the existing survey locations are considered acceptable for this addendum to assess the following:
 - Potential noise impact upon the Site (façade noise levels and acoustic requirements); and
 - Background sound level to assess the noise impact upon existing noise-sensitive receivers (some NSRs only. Additional measurements undertaken)

As noted above, additional noise surveys were carried out where there were gaps in the previous assessment. The existing noise surveys are considered to be representative of the baseline conditions of the Site. In order for there to be a noticeable change in ambient noise levels the existing levels would have to increase by 3 dB, which would require a doubling of road traffic and a doubling of train pass-bys, which is not the case. Further, as seen from Figure 3—1 and Figure 3—2, there have been no major developments constructed around the Site between the years 2019 and 2022. Therefore, no additional have been undertaken for this addendum.

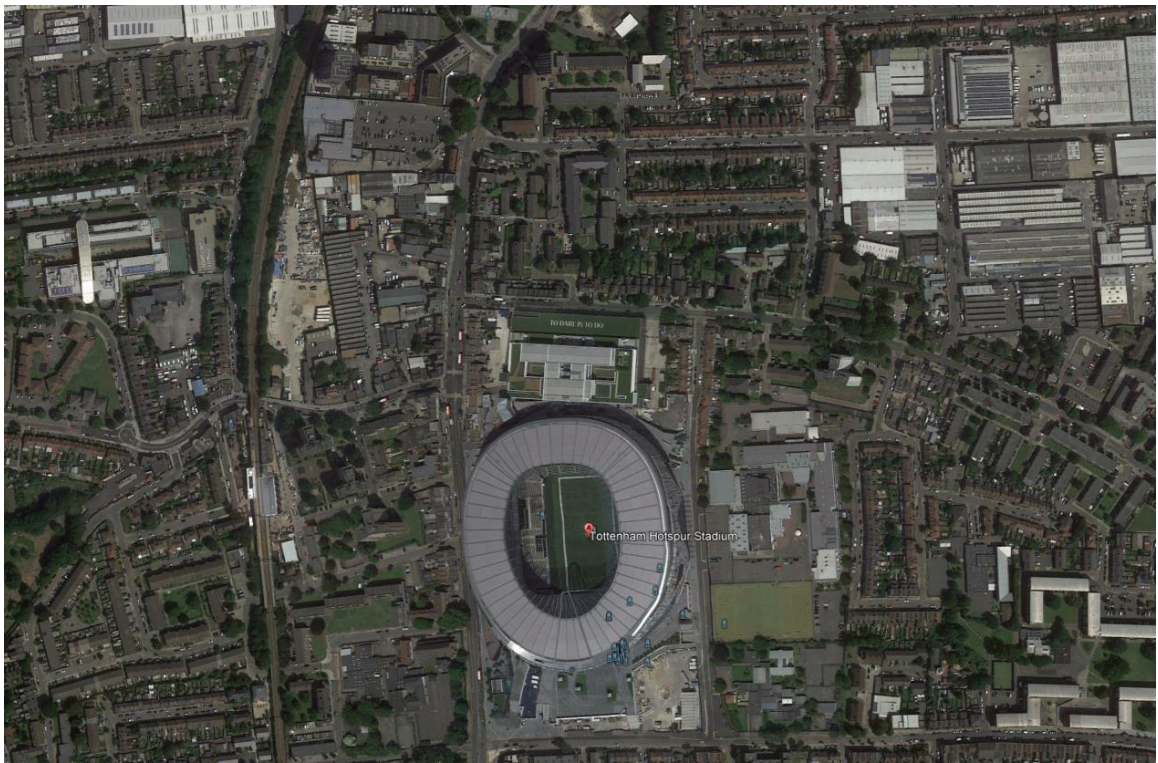


Figure 3—1 Aerial view of the Site in June 2019 (source: Google Earth)

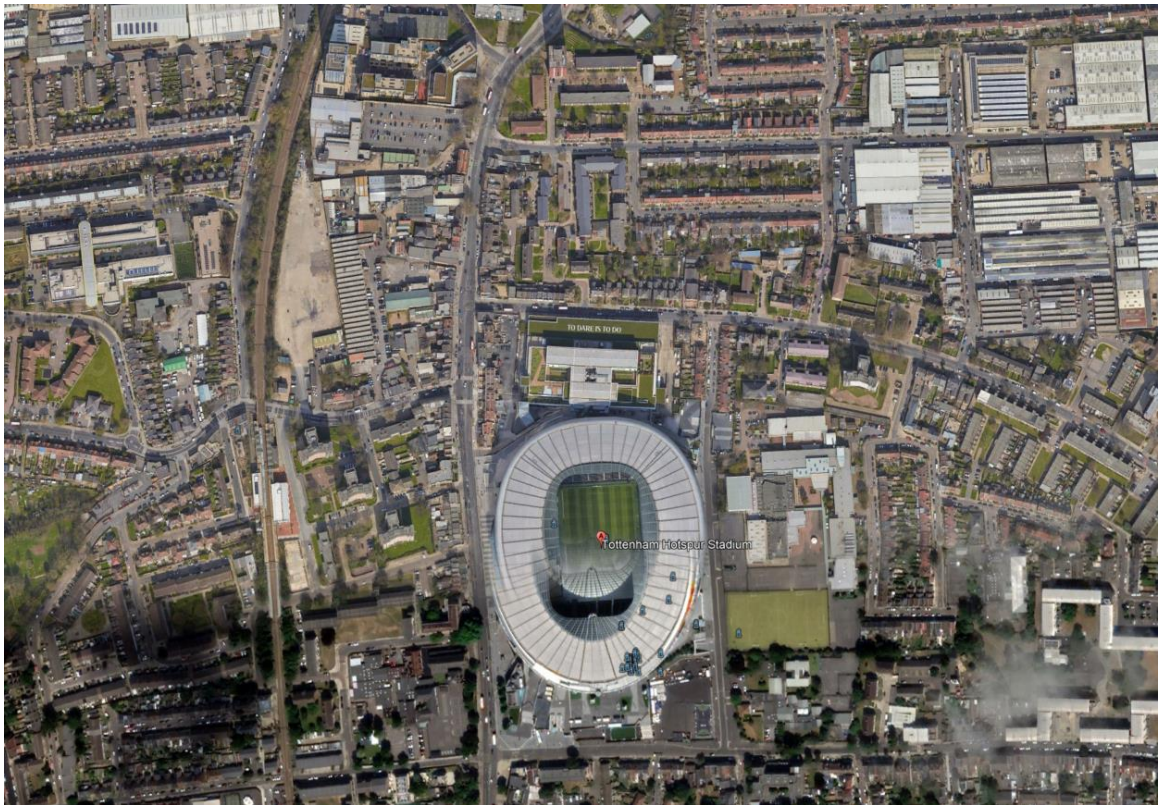


Figure 3—2 Aerial view of the Site in March 2022 (source: Google Earth)

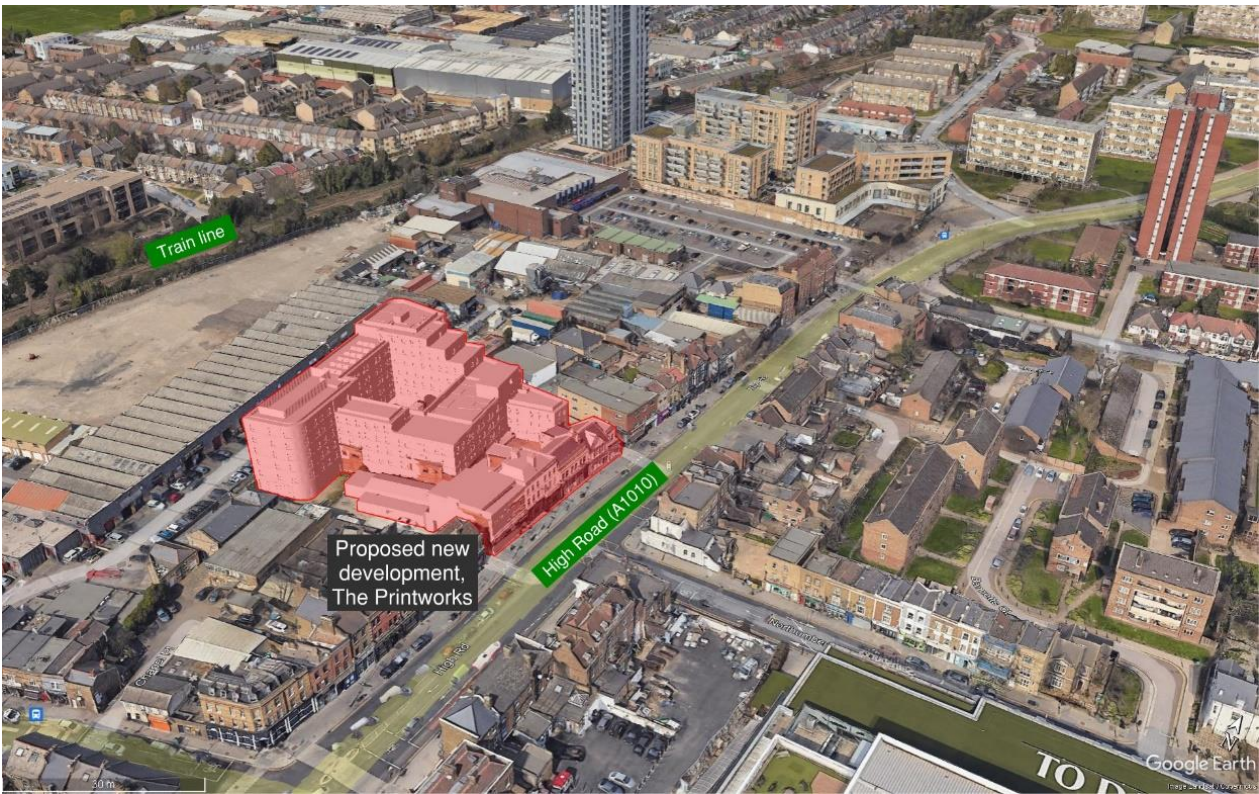


Figure 3—3 The Printworks model from Revit imposed onto the site in Google Earth.

3.2 Noise Survey Methodology

3.2.1 WSP survey locations

An environmental noise survey was carried out between 25th August 2017 to 1st September 2017 and 27th February 2019. The survey measurements were conducted at four locations, as shown in Figure 3—4, where:

Long-term

- LT 1 – Unattended long-term measurement. Located west of the development site, approximately 10-15m from the railway line. The microphone was located at the height of 3.5m above the ground in free-field conditions with a direct line of sight to the railway line.

Short-term

- ST 1 – This position was located outside of the Site boundary to the south of White Hart Lane adjacent to the junction with Love Lane. The microphone was positioned at the height of 1.5m above the ground
- ST 2 – This attended measurement was located on the eastern site boundary 5 metres from High Road. A noise measurement in accordance with the shortened measurement procedure of Calculation of Road Traffic Noise (CRTN). The microphone was at the height of approximately 1.5 metres above the ground
- ST 3 – This attended measurement on High Road, adjacent to the playground of Brook House Primary School. A 13-minute measurement during a school break time. The microphone was at the height of approximately 1.5 metres above the ground

The WSP locations are considered to be acceptable for this assessment as measurement position ST 1 is the noise due to the railway that will impinge on the western side of the development. Measurement positions ST 2 and ST 3 are indicative of the traffic flow noise along High Road. Although their location is approximately 200 north of the development site, traffic noise levels are expected to be the same along the same stretch of High Road. These three positions are used to calibrate CadnaA environmental noise models utilised in analysing noise across the whole of the development.

3.2.2 Instrumentation

The noise instrumentation was used during the WSP noise survey can be found in Table 3—1.

3.2.3 Weather condition

The WSP noise survey report states:

"The weather conditions during the survey were mostly considered suitable for the measurement of noise and vibration, it being dry with little or no wind. There were occasional short periods of rain during Wednesday 30th August and Thursday 31st August 2017, however these short periods are considered not to have adversely influenced the measured noise levels. The weather conditions on 27th February 2019 were also suitable for baseline noise measurements; it being warm and calm."

"The weather conditions during the noise survey were mostly considered suitable for the measurement of noise, it being dry with little or no wind. There were occasional short periods of rain during Wednesday 30th August and Thursday 31st August; however these short periods are considered not to have adversely influenced the measured noise levels."



Figure 3—4 WSP Noise Survey Locations (August and September 2021)

Table 3—1 WSP survey instrumentation

Table A00.3: Baseline Survey Equipment			
Equipment	Manufacturer and Type Number	Serial Number	Calibration Due Date
Sound Level Meter	01 dB CUBE	10629	16 September 2018
Pre-amplifier	Acoem PRE 22	10563	
Microphone	GRAS 40CD	161937	
Calibrator	01 dB-Metravib CAL 21	34344462	21 September 2018
Sound Level Meter	01dB-METRAVIB Solo Master	65704	08 June 2018
Pre-amplifier	01dB-Stell PRE 21 S	16925	
Microphone	Microtech Gefell GmbH MCE212	153382	
Calibrator	01dB-Metravib Cal 21	34134167	09 June 2018

3.3 Buro Happold Noise Survey

Buro Happold undertook an acoustic survey on Thursday, 14th of May 2021 during the night to supplement the data collected above. The survey was primarily focused on capturing the background sound level during the night-time period to identify the fixed plant noise limits at the identified noise sensitive receivers.

Survey measurements were conducted at two locations, as shown in Figure 3—5, where:

- ST 4 – Representative location of NSRs located north of the Printworks site
- ST 5 – Representative location of NSRs located south of the Printworks site
- ST 6 – Representative location of NSRs located east of the Printworks site

The attended measurements were carried out in 15-minute time periods in a circuit fashion.

As previously stated, there have been no major developments within the area since this survey was undertaken, therefore this survey remains relevant and further supports the measurements taken previously.

3.3.1 Instrumentation

The noise instrumentation was used during the noise survey, generally, according to BS EN 60651:1994 and BS 7445:1993 can be seen in Table 3—2

3.3.2 Weather condition

The weather conditions during the survey were noted as being 9°C in temperature with wind speeds no greater than 5 m/s. No precipitation was present during the measurement period.



Figure 3—5 Buro Happold survey locations (May 2021)

Table 3—2 Buro Happold noise survey instrumentation

Description	Model No.	Serial No.
Handheld sound analyser	B&K 2250	3008216
Condenser Microphone	B&K 4189	2983647
Brüel Kjær Acoustic Calibrator	B&K 4231	2438725

3.4 Noise Survey Results

3.4.1 WSP Survey Results

The environmental noise survey carried out by WSP, is adopted for the purpose of this assessment and has been taken in good faith as being accurate and valid. The noise survey was accepted by the Council in approving the extant consents, and remains a robust analysis.

The definition of the measurement indices are as follows:

- **L_{Aeq,T}** – the average A-weighted sound pressure level within a measurement period (15 minutes in this case). Typically thought of as the average ambient noise level at a particular time and likely to be due to a combination of various noise sources, near and far
- **L_{A90,T}** – the A-weighted sound pressure level exceeded for 90% of the measurement period. i.e. a level which would be perceived as a constant, background noise level. Typically, this measurement parameter is largely unaffected by local traffic pass-bys or transient events. It is more usually attributable to constantly running building services plant or distant road traffic (e.g. what you would hear when there is no local traffic pass-bys present (or other readily-identifiable noise sources
- **L_{A10,T}** – the A-weighted sound pressure level exceeded for 10% of the measurement period. i.e. a level which would be perceived as a higher portion of the levels at any particular time. Typically determined by local traffic pass-bys or transient events. An example may be an emergency vehicle siren
- **L_{AF,max}** – the maximum instantaneous A-weighted sound pressure level measured typically during a 15-minute time period. Typically corresponding to a short-duration event with a very high sound pressure level (SPL), for example, motorbike passing by, car horn etc.

The design levels are considered to best represent the main development site and its surroundings in terms of the existing noise levels. The following have been adopted:

- Typical ambient noise level measured – logarithmically averaged L_{Aeq,15 min} dB
- Lowest of the most commonly occurring measured background noise level (L_{A90,15 min} dB)
- Obtained following the CRTN shortened measurement procedure. The procedure involves measuring three consecutive L_{A10,1hr} measurements between 10:00 and 17:00 hours. The logarithmic average of the three L_{A10,1hr} measurements are obtained to give the L_{A10,3hr}
- 90th percentile of the measured 5-minute maximum noise levels (L_{AF,max} dB)

The survey results are reproduced in the figures and tables across. The conversions from the CRTN shortened measurement procedure used to obtain the relevant acoustic parameters are as follows:

- $L_{A10,18hr} = L_{A10,3hr} - 1 \text{ dB}$
- Daytime existing ambient noise level $L_{Aeq,16hr} = L_{A10,18hr} - 2 \text{ dB}$
- Night-time existing ambient noise level $L_{Aeq,8hr} = 0.90 \times L_{A10,18hr} - 3.77 \text{ dB}^1$

¹ Method for Converting the UK Road Traffic Noise Index L_{A10,18h} to the EU Noise Indices for Road Noise Mapping. Non-motorway road (equation 3).

It should be noted that a correction was made to the night-time design level at ST1. The correction is reproduced below and considered to be a robust approach in assessing the environmental noise climate.

At Measurement Position 2 (ST1), the noise climate was dominated by road traffic noise on White Hart Lane, which included frequent buses in both directions. Online bus timetable information indicates that the buses service run from approximately 04:45 – to 00:30 hours each day. During the measurement period, trains from the adjacent railway made a negligible contribution to the measured noise levels. However during parts of the night-time period, when trains are still operating but traffic flows have reduced, it is anticipated that noise emanating from the railway would contribute to the noise climate at Measurement Position 2. Therefore, to determine a meaningful night-time value in the southern area of the Site, the night-time level measured at position 1 has been added to the predicted night-time value from position 2, which itself has been derived in accordance with the TRL Method 3 for a non-motorway road (i.e. 58 dB + 58 dB). Both measurement positions were at the same approximate distance from the railway. This night-time level of 61 dB $L_{Aeq, 8h}$ is 5 dB below the estimated $L_{Aeq, 16h}$ value of 67 dB, which appears to be a rational day-night differential for this type of road in London

Furthermore, a conservative LA90 background sound level was adopted for LT 1 due to the influence of construction noise to the north.

At Measurement Point 1 (LT1), the noise climate was heavily dominated by railway noise from the line adjacent to the western Site boundary. During the weekday daytime periods the L_{A90} was likely to have been influenced by noise emanating from current on-site activities associated with the construction compound, including concrete mixers, heavy goods vehicle movements and use of the on-site storage area in the north. Therefore, greater focus was placed on determining an appropriate L_{A90} value for the weekend period, when there were fewer, if any, on-site construction compound activities.

Adopting a typical L_{A90} background sound level towards the quieter end of the spectrum should result in a more robust assessment, with plant noise limits at existing NSRs being more onerous than adopting a higher typical background sound level.

DATE	DAY	DAY ¹		NIGHT ¹		
		L _{Aeq,16h}	L _{A90,15m} ²	L _{Aeq,8h}	L _{AFMax} ³	L _{A90,15m} ²
25/08/2017	Friday	62 ⁶	42	56	79	39
26/08/2017	Saturday	57		53	78	
27/08/2017	Sunday	57		54	79	
28/08/2017	Monday ⁴	57		55	78	
29/08/2017	Tuesday	63		58	80	
30/08/2017	Wednesday	63		58	80	
31/08/2017	Thursday	64		58	80	
01/09/2017	Friday	64 ⁶		n/a ⁵	n/a ⁵	
WEEKDAY AVERAGE		63	n/a ⁵	58	80	n/a ⁵
1. DAY = 0700 – 2300 HOURS, NIGHT = 2300 – 0700 HOURS. 2. THE LOWEST OF THE MOST COMMONLY OCCURRING 15 MINUTE BACKGROUND LEVEL. 3. THE 90 TH PERCENTILE OF THE 5 MINUTE L _{AFMAX} LEVEL FOR EACH NIGHT-TIME PERIOD. 4. BANK HOLIDAY. 5. NO DATA OR NOT APPLICABLE. 6. PART PERIODS (I.E. NOT FULL 16-HOUR PERIOD)						

Figure 3—6 LT 1 measurement results (source: WSP Noise survey Assessment report)

Date	Day	Time	L _{Aeq,1h}	L _{A10,1h}
01/09/2017	Friday	1119 – 1219	67	69
		1219 – 1319	70	71
		1319 – 1419	67	70
L _{A10,3h} ¹		70		
L _{A10, 18h} ²		69		
L _{Aeq, 16h} ³		67		
L _{Aeq, 8h} ⁴		61		
1. Determined by the arithmetic average of the three L _{A10,1h} values above, as detailed in CRTN.				
2. Determined by subtracting 1 dB(A) from the L _{A10,3h} value, as specified in CRTN.				
3. Determined by subtracting 2dB(A) from the L _{A10, 18h} value, as specified in BS 8233.				
4. Determined by adding the night-time value from Measurement Point 1 and the predicted night-time value using Transport Research Laboratory (TRL) Method 3 for a non-motorway (see explanation below).				

Figure 3—7 ST 1 measurement results (source: WSP Noise survey Assessment report)

Regarding noise due to the adjacent industrial areas neighbouring the site, WSP was unable to access the construction compound to assess the noise from Peacock Industrial Estate. However, it was noted in the WSP report that *“during the site visits for the noise and vibration surveys, there was subjectively considered to be little or no noise from Peacock Industrial Estate.”* Furthermore, the long term measurement that was taken over multiple days likely include contributions from the industrial site.

3.4.2 Buro Happold Survey Results

A summary of the results is detailed in the tables below. The included descriptors are as follows:

- **$L_{Aeq,T}$** – the average A-weighted sound pressure level within a measurement period (typically 15 minutes, in this case). Typically thought of as the average ambient noise level at a particular time, and likely to be due to a combination of various noise sources, near and far
- **$L_{A90,T}$** – the A-weighted sound pressure level exceeded 90% of the measurement period, i.e. a level which would be perceived as a constant, background noise level. Typically, largely unaffected by local traffic pass-bys or by transient events. More usually attributable to constantly-running building services plant or distant road traffic. What you would hear when there is no local traffic present (or other readily-identifiable noise source).

Noise levels measured during the survey are summarised in Table 3—5.

3.4.3 Discussion

The observations made by WSP state that the main noise sources were from the train line and road noise from High Road. The same was observed by the Buro Happold acoustician who attended site.

At LT1, it is noted that the noise climate is heavily influenced by the railway noise to west of the site boundary with ambient noise level of $L_{Aeq,16hr}$ 63 dB during the day and $L_{Aeq,8hr}$ 58 at night. ST1 is heavily influenced by road traffic from White Hart Lane with ambient levels of $L_{Aeq,16hr}$ 67 dB during the day and $L_{Aeq,8hr}$ 61 dB at night. It should be noted that there are some minor influences from the London Overground.

Table 3—3 ST 2 and ST 3 measurement results (source: WSP Noise survey Assessment report)

Measurement location	Period	L _{Aeq,T} - dB	L _{A10,3hr} - dB	L _{AF,max} - dB
ST 2	10:45 – 13:45	69	69	94
ST 3	13:48 – 14:01	69	-	-

Table 3—4 CRTN day and night-time correction methodology at ST 2

Measurement location	Period	L _{Aeq,T} - dB	L _{AF,max} - dB
ST 2	Day (07:00 – 23:00)	66	-
	Night (23:00 – 07:00)	57	93

Table 3—5 Buro Happold noise survey results – 14/05/21

Location	Period	L _{Aeq,15mins} - dB	L _{A90,15min} - dB	Comments
ST4	00:54 – 01:09	52	44	Distant road traffic from High Road was the main source of noise with general chatter and occasional cars driving past.
	02:00 – 02:15	47	41	
ST5	01:22 – 01:37	57	45	Road traffic from White Hart Lane was the main source of noise. Distant traffic noise from High Road. Occasional chatter.
	02:19 – 02:34	55	42	
ST6	01:42-01:57	76	53	Noise dominated by road traffic along High Road. A high volume of emergency vehicles with sirens on.
	02:38-02:53	67	48	

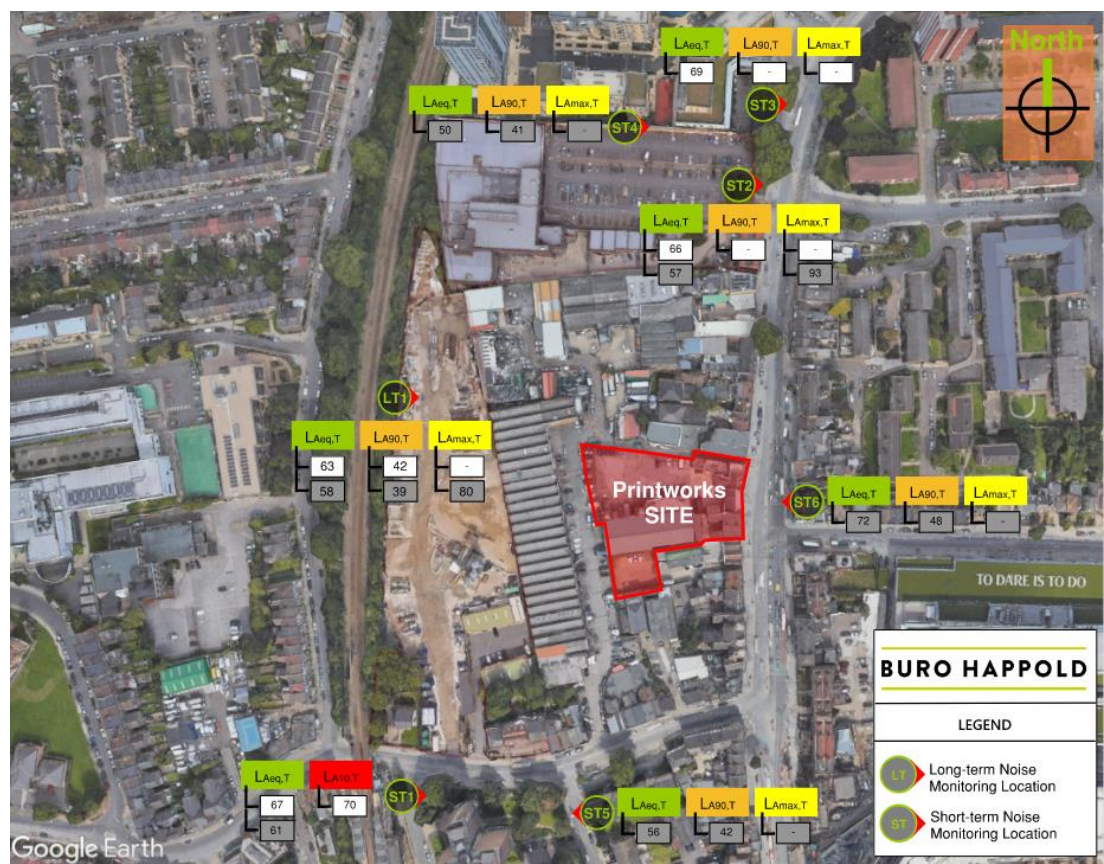


Figure 3—8 Adopted design noise levels

Noise at ST2 is dominated by road traffic from High Road with ambient noise levels of $L_{Aeq,16hr}$ 66 dB during the day and $L_{Aeq,8hr}$ 57 at night. It should be noted that the L_{AFmax} value at the ST2 is particularly high at L_{AFmax} 93 dB. This is due to a high number of emergency services sirens going up and down High Road.

In general, the analysis of the noise monitoring data indicate that the site is subject to medium to high noise levels. The results have been used to calibrate an environmental acoustic model (described in more detail in the following section), which will be used in the assessment of the suitability of natural ventilation and façade/glazing specifications for the school.

In terms of planning, the results of the noise survey will be used to set out the plant noise limits from the development at the nearest noise sensitive receptors in line with the Haringey Council Planning requirements.

3.5 Noise Impact of Tottenham Hotspur Stadium

Colour contoured noise maps were produced to show the noise impact of the Tottenham Hotspur Stadium during match-days and live concert mode. Noise maps are a graphical way to show how sound propagates from a noise source, with colours representing a range of noise levels. Hotter blue colours represent high noise levels, while cooler green colours represent lower noise levels.

The assessment was carried out as part of the planning application for the Stadium and reproduced below to assess the potential noise impact upon the proposed Printworks development.

3.5.1 Match-day Scenario

As shown in Figure 3—9, noise spill from the Stadium during match-days was calculated to be up to $L_{Aeq,T}$ 45 dB at the proposed development site. Given that the calculated level ($L_{Aeq,T}$ 45 dB) is significantly lower than the ambient noise level generated by existing roads and the Overground (circa $L_{Aeq,16hr}$ 67 dB), the Stadium is not expected to contribute to the overall noise climate during match-days.

3.5.2 Concert mode

As shown in Figure 3—10, the noise spill increases to $L_{Aeq,T}$ 55 dB during a concert mode scenario. However, the increase is not expected to influence the overall noise climate around the proposed development site as the ambient levels from surrounding roads, and the Overground is significantly higher. Therefore, the Tottenham Hotspur Stadium is not expected to contribute to the overall noise climate around the development site.



FIGURE 4b - Noise map showing event noise from football events

Figure 3—9 Noise map during a match-day scenario (reproduced from the THFC planning report)

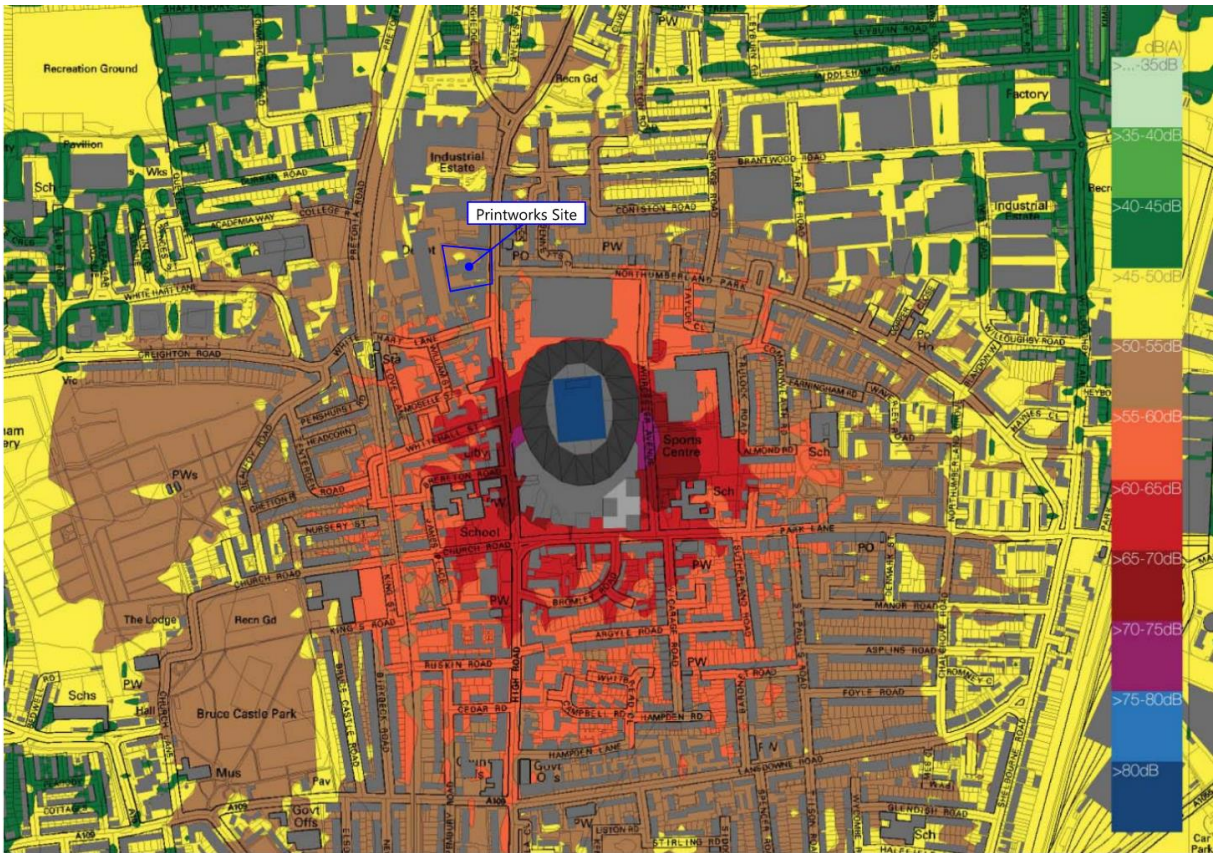


Figure 3—10 Noise map during a concert scenario (reproduced from the THFC planning report)

4 3D Acoustic Modelling

4.1 Introduction

A noise modelling exercise has been undertaken to calculate the façade noise level across the proposed elevations of the development. The façade noise levels are used to assess the feasibility of adopting a natural ventilation strategy as well as the specification of appropriate sound insulation values for façade glazing and identifying any potential cost saving through, for example, only localised use of higher-performing glass, as opposed to the entire façade.

4.2 Methodology

The 3D acoustic model was created using CadnaA® version 2019 acoustic software. Local roads were added to the model to simulate noise sources that were measured during the on-site noise survey. The sources were then calibrated to match the measured noise levels taken across the site to represent the typical noise levels to which the proposed development will be exposed, during its hours of operation. The model maps the predicted noise impacts on the proposed façades, considering factors such as distance attenuation, natural and man-made barrier attenuation, reflections, and source directivity.

4.3 Limitations

The assessment has been based on the results produced through a noise modelling exercise, which provides predictions on the likely future noise levels. In order to increase the reliability of the results, the models have been calibrated to the noise levels measured on-site, as described in Section 3.

However, this does not guarantee full accuracy of the predicted noise levels. Typically, an uncertainty within a range of approximately ± 3 dB could be expected from computer noise modelling software. However, this uncertainty has been controlled as far as practicable by cross-referencing the levels of predicted noise impact against the spot measurements captured on site.

4.4 Results

Images captured from the acoustic model are presented in the subsections below. The figures illustrate the highest calculated façade ($L_{Aeq,T}$ dB) noise level across each building elevation, regardless of the building height. Also included are 3D graphical representations of how the predicted noise levels vary across the various façade orientations and heights.

Small variations in the assumed building heights are not expected to have a significant impact on the façade noise predictions and façade performance calculations.

4.4.1 Day-time

The daytime façade noise levels for $L_{Aeq,16hours}$ across the Printworks are illustrated in Figure 4—2, Figure 4—5, and Figure 4—6.

4.4.2 Night-time

The night-time façade noise levels $L_{Aeq,8hours}$ across the Printworks are illustrated in Figure 4—3, Figure 4—7, and Figure 4—8.

Night-time L_{AFmax} values were also calculated to assess the sound propagation of intermittent noise sources such as emergency vehicle sirens across the development site and façade elevations.



Figure 4—1 The Printworks Revit model and daytime CadnaA noise map imposed on the site in Google Earth

4.5 Discussion

As can be seen from the modelling exercise, the elevations of the building are subject to varying levels of environmental impact.

Elevations facing east are subject to higher noise levels (up to around 72 dBA daytime $L_{Aeq,16\text{ hours}}$) associated with road traffic noise from High Road.

Elevations facing north are subject lower noise levels due to their distance from the high traffic from High Road, but still subjected to the noise from Brunswick Square.

Elevations facing south are subject lower noise levels due to their distance from the high traffic from High Road, but still subjected to the noise from White Hart Lane.

Elevations facing west are subject to lower noise levels due to their distance from the high traffic from High Road, and shielded by the Printworks development itself, but still subjected to some noise from the local road that will be created to the west of the development. The elevations are also shielded from the rail line noise from the other developments to the west of the Printworks, primarily Goods Yard.

Finally, the units that face inward to the development experience the lowest noise levels due to shielding from the development.

These façade noise levels have implications for the glazing and the ventilation strategy, which are explored in the following sections. It is noted that some of the levels predicted are at the upper range of what is understood to be considered a suitable external acoustic environment for residential accommodation. However, it is noted that the overriding consideration is providing future residents with an appropriate internal acoustic environment in which to sleep, rest, etc.

This is reflected in the requirement for dwellings is to achieve the required internal noise levels of 35/30 dB $L_{Aeq,T}$ for daytime/night-time respectively, as referenced in BS 8233. Despite the comparatively higher external levels, Buro Happold have significant experience in achieving these internal levels even in high noise environments through the appropriate levels of acoustic façade design, and the following section focusses on achieving this here also.

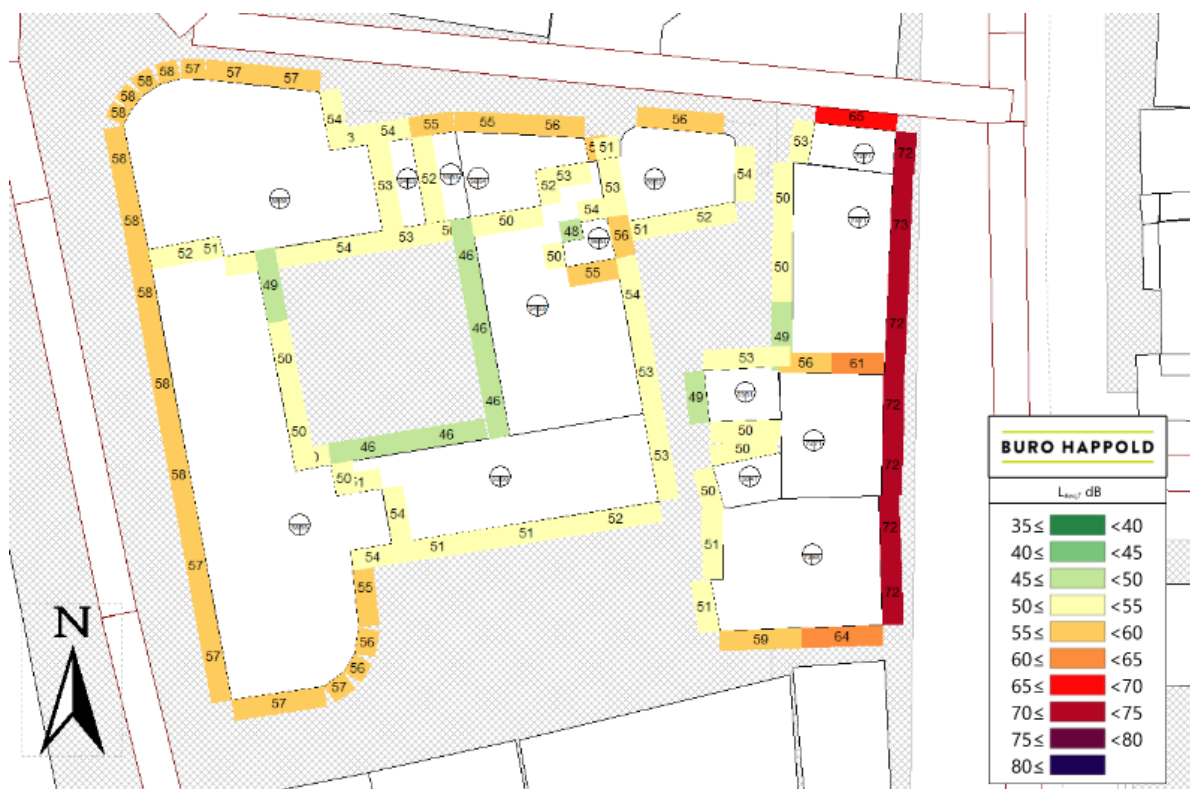


Figure 4—2 Daytime highest façade noise levels ($L_{Aeq,16hours}$), irrespective of height

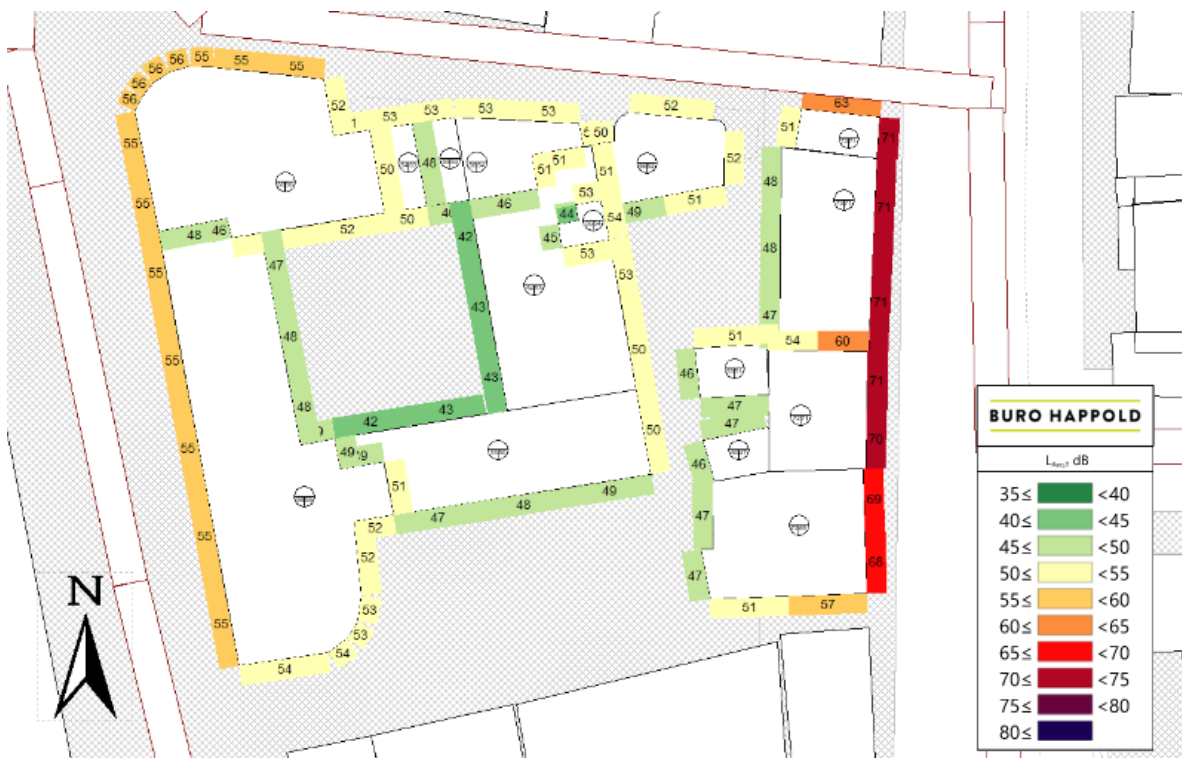


Figure 4—3 Night-time highest façade noise levels ($L_{Aeq,8hours}$), irrespective of height

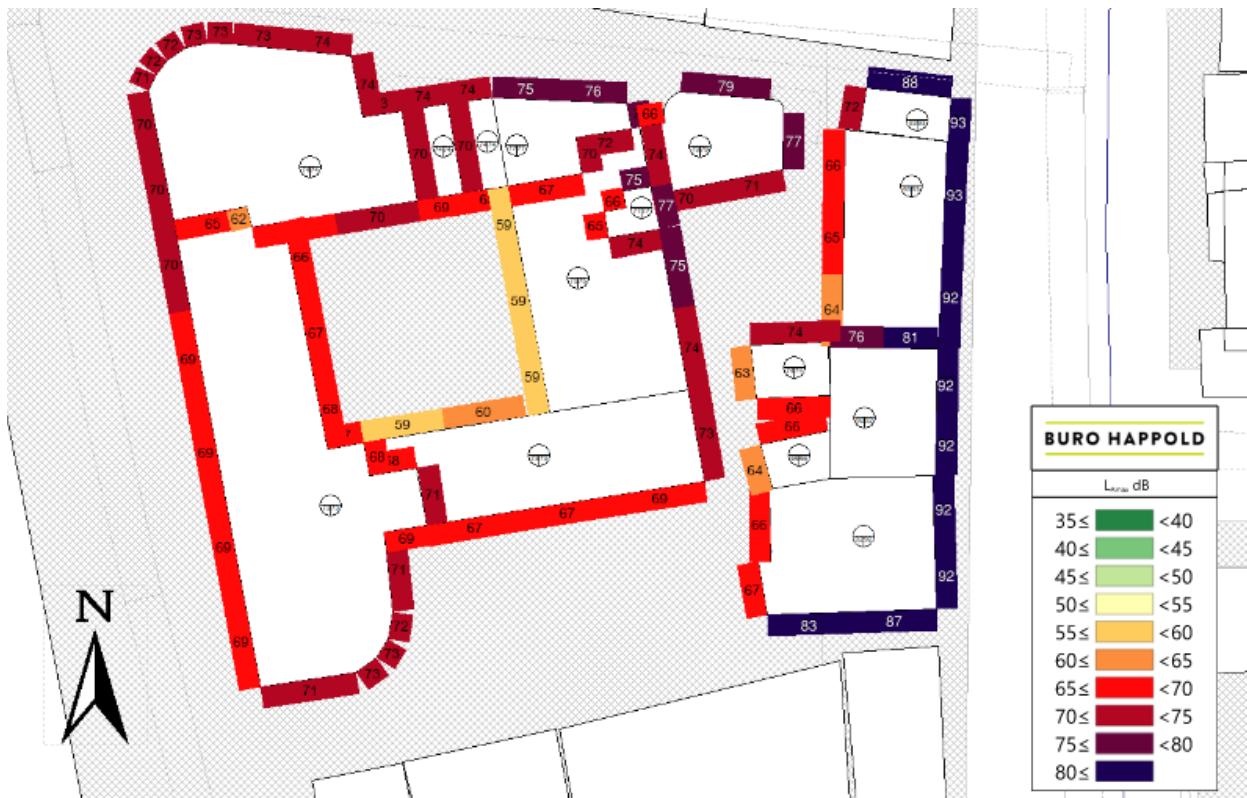


Figure 4—4 Highest max façade noise levels (L_{AFmax}), irrespective of height

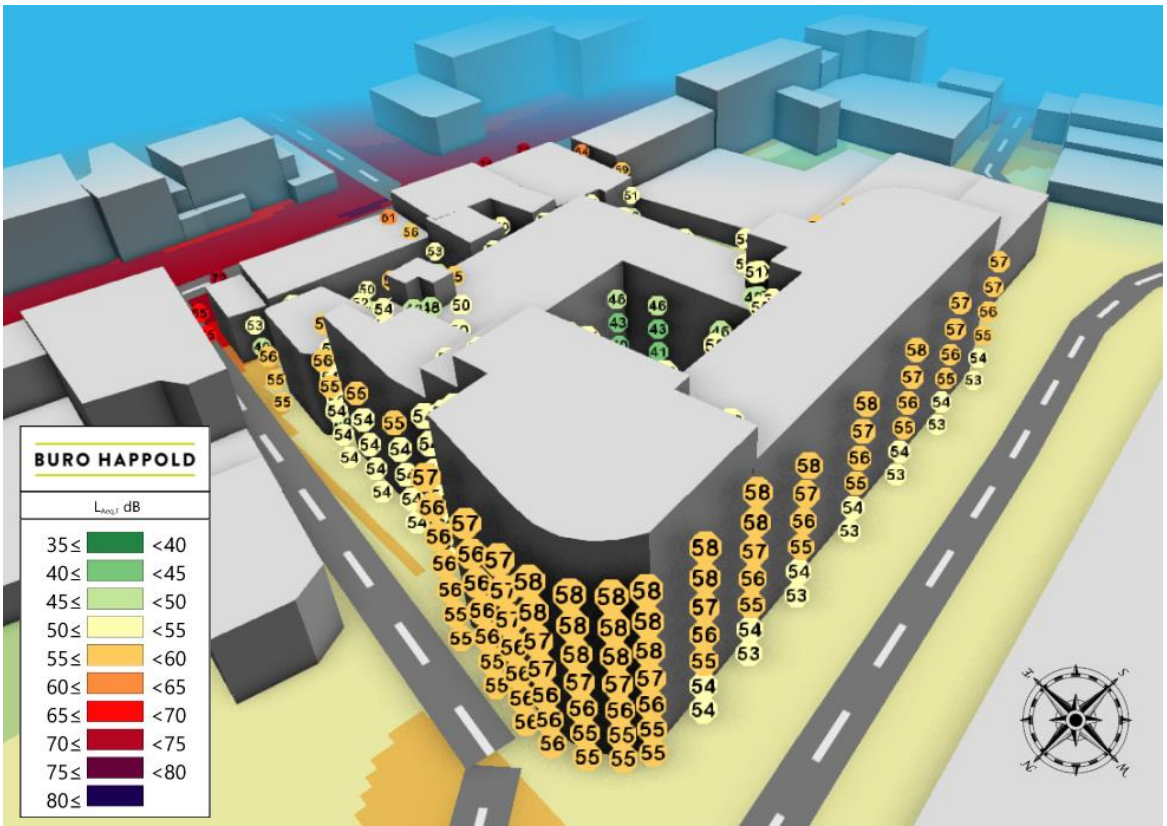


Figure 4—5 Daytime façade noise levels of the Printworks from the northwest view

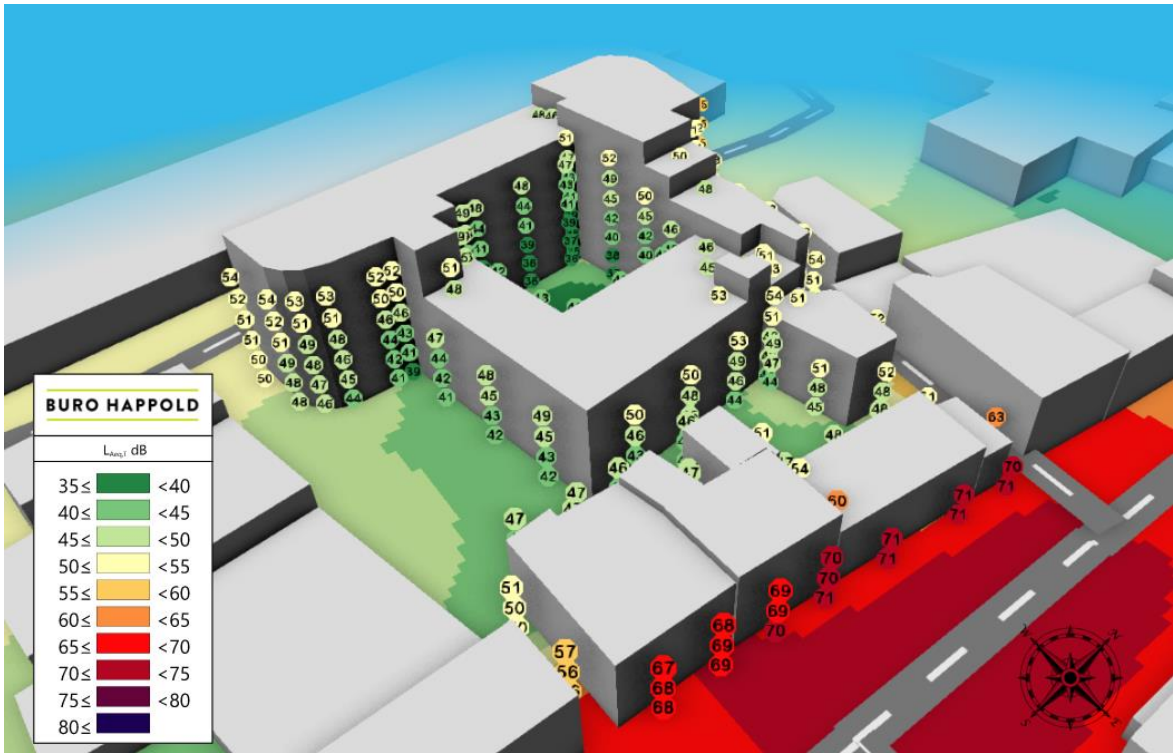


Figure 4—6 Daytime façade noise levels of the Printworks from the southeast view

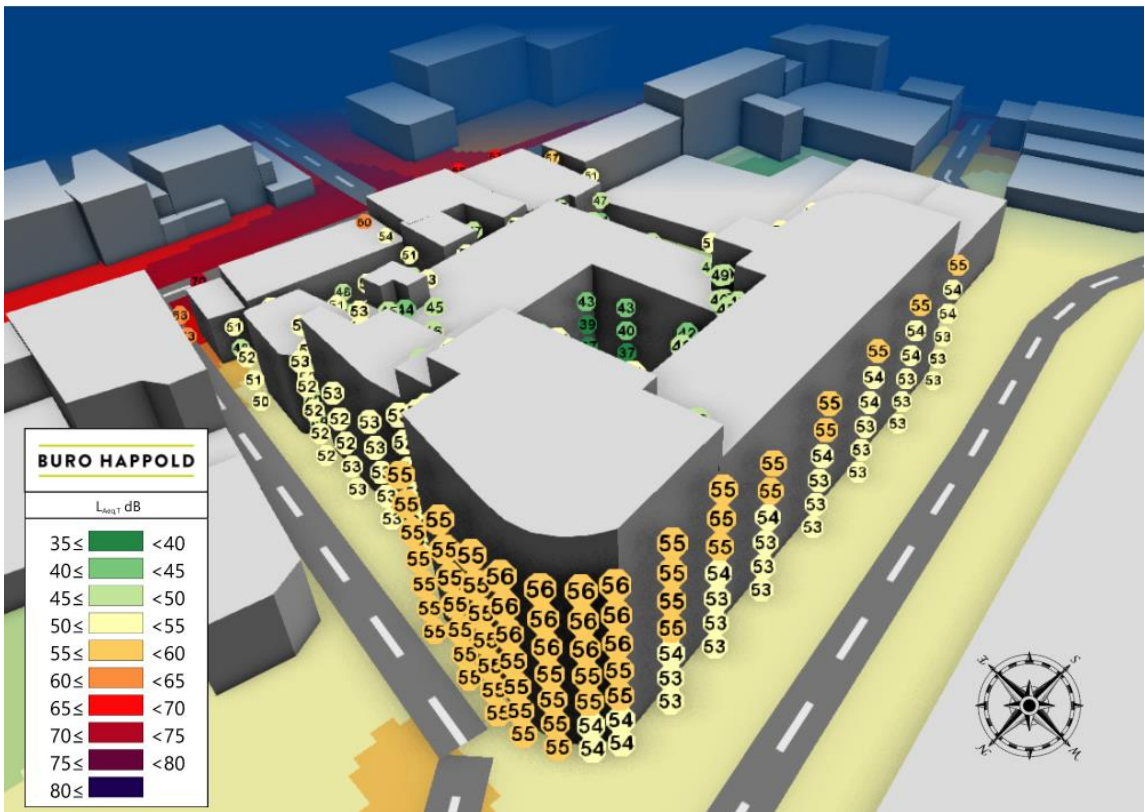


Figure 4—7 Night-time façade noise levels of the Printworks from the northwest view

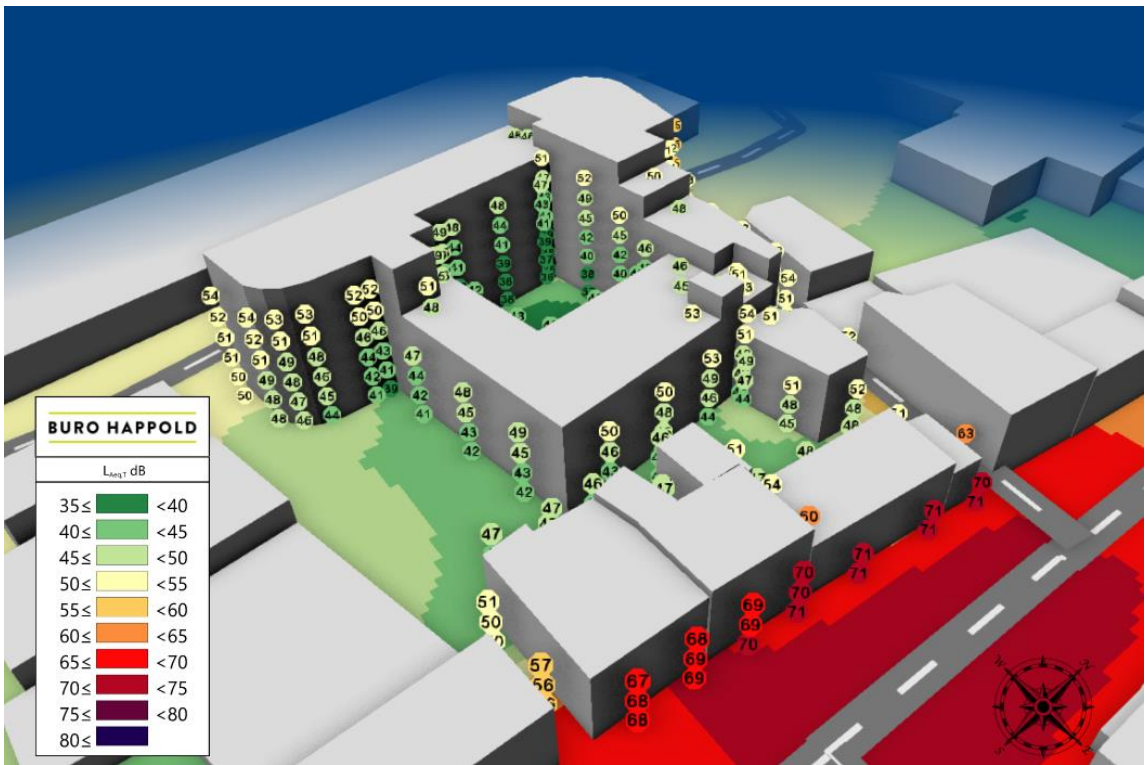


Figure 4—8 Night-time façade noise levels of the Printworks from the southeast view

5 Façade Acoustic Design & Noise Break-In

5.1 Introduction

The following section sets out the acceptable internal ambient noise level (IANL) criteria within residential dwellings (including student accommodation) and non-residential areas parts of the proposed development. The façade sound insulation requirements are also outlined in this section.

The acoustic design of the façade depends primarily on two factors: the existing levels of external noise and the target internal ambient noise levels for each space. The indoor ambient noise level (IANL) includes noise contributions from:

- The external ambient noise sources such as industrial, road traffic and rail noise
- The noise generated by building services

However, it excludes noise generated by occupants.

It is generally accepted that glazing and ventilation openings within external façades are the weakest façade elements acoustically, therefore the design focuses on these elements.



Figure 5—1 Sources of environmental noise

5.2 Acoustic Design Criteria – Acceptable Indoor Ambient Noise Levels

The following section outlines acceptable ambient noise level criteria for various spaces across the proposed development. These include living areas, commercial premises, and outdoor amenity areas.

5.2.1 Living Areas

BS 8233:2014 and WHO guidelines provide criteria for acceptable internal ambient noise levels that are considered appropriate for the protection of residential amenity. Acceptable internal ambient noise levels within specific room types shall not exceed the values detailed in Table 5—1. The internal ambient noise level includes noise contributions from steady-state noise sources such as:

- External noise such as traffic, rail, aircraft, and industrial/commercial noise
- Building services such as ventilation systems, mechanical plant, and drainage

It does not include noise generated by occupants and noise associated with the operation of white goods and televisions.

Sleep disturbance can be defined as the disruption of a person's normal sleep patterns due to intermittent noise events such as aircraft fly-bys or emergency vehicle sirens. Acceptable internal ambient noise levels within sleeping areas from intermittent noise events shall not exceed the value detailed in Table 5—2 more than 10-15 times per night².

Table 5—1 Acceptable internal ambient noise levels (Source: WHO Guidelines for Community Noise and BS 8233:2014)

Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Resting	Living Room	$L_{Aeq,16\text{ hour}}$ 35 dBA	-
Dining	Dining room/area	$L_{Aeq,16\text{ hour}}$ 40 dBA	-
Sleeping (daytime resting)	Bedroom	$L_{Aeq,16\text{ hour}}$ 35 dBA	$L_{Aeq,8\text{ hour}}$ 30 dB

Table 5—2 Acceptable internal ambient noise levels – Sleep disturbance (Source: WHO Guidelines for Community Noise)

Activity	Location	$L_{AF,max}$ Night-time (23:00 – 07:00)
Sleeping (day time resting)	Bedroom	45 dB

² WHO's 'Guidelines for Community Noise' references a study by Vallet & Vernet, 1991, which concluded that "for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately $L_{AF,max}$ 45 dB more than 10-15 times per night.

5.2.2 Outdoor Amenity Areas

Guidance given in BS 8233:2014 states that:

'For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic

transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.'

5.3 Proposed Ventilation Strategy

It is understood that the ventilation strategy across the proposed development is to consist of mechanical supply and extract ventilation via localised MHVR (mechanical ventilation with heat recovery) units, with one ceiling unit servicing a student cluster. Therefore, the implemented ventilation scheme should be capable of providing the background ventilation rates given in Part F of the Building Regulations.

MVHR units, by their nature, are effective at preventing the ingress of environmental noise due to removing the need for un-ducted/un-attenuated openings in the external elevation required by natural systems (i.e. trickle vents or open windows). On this basis, the level of external noise break-in through the MVHR system is likely to be negligible, and the internal noise levels within the dwellings are therefore likely to principally be a product of the sound reduction performance of the external glazing systems

5.3.1 Purge ventilation

Although opening windows should not be necessary in order to provide background ventilation, the windows may still be operable for purge ventilation as defined in Part F (for example, following painting or accidental burning of food³) or at the occupant's choice.

In this instance, internal ambient noise levels may exceed the limits given in Section 5.2.1, however this would be considered acceptable due to the short duration and infrequent occurrence of this situation, where the requirement for purge ventilation temporarily takes precedence over low internal ambient noise levels.

³ Ref: Building Regulations Part F Section 4.15.

5.4 Façade Design Noise Levels

The façade design noise levels are based on the noise mapping calculations outlined above and rationalised to simplify the façade sound insulation requirements across each building elevation. The façade design noise levels have been broken down into four categories which represent a range of noise levels, with the higher façade noise level being used to calculate the façade sound insulation requirements. Figure 5—2 details the façade design noise levels across each elevation.

The $L_{A\text{Fmax}}$ design noise levels have been broken down into four categories, as shown in Figure 5—3. The most onerous noise level, that being either the day, night, or max noise level versus the acceptable IANL criteria was used to specify the glazing requirements of the façade.

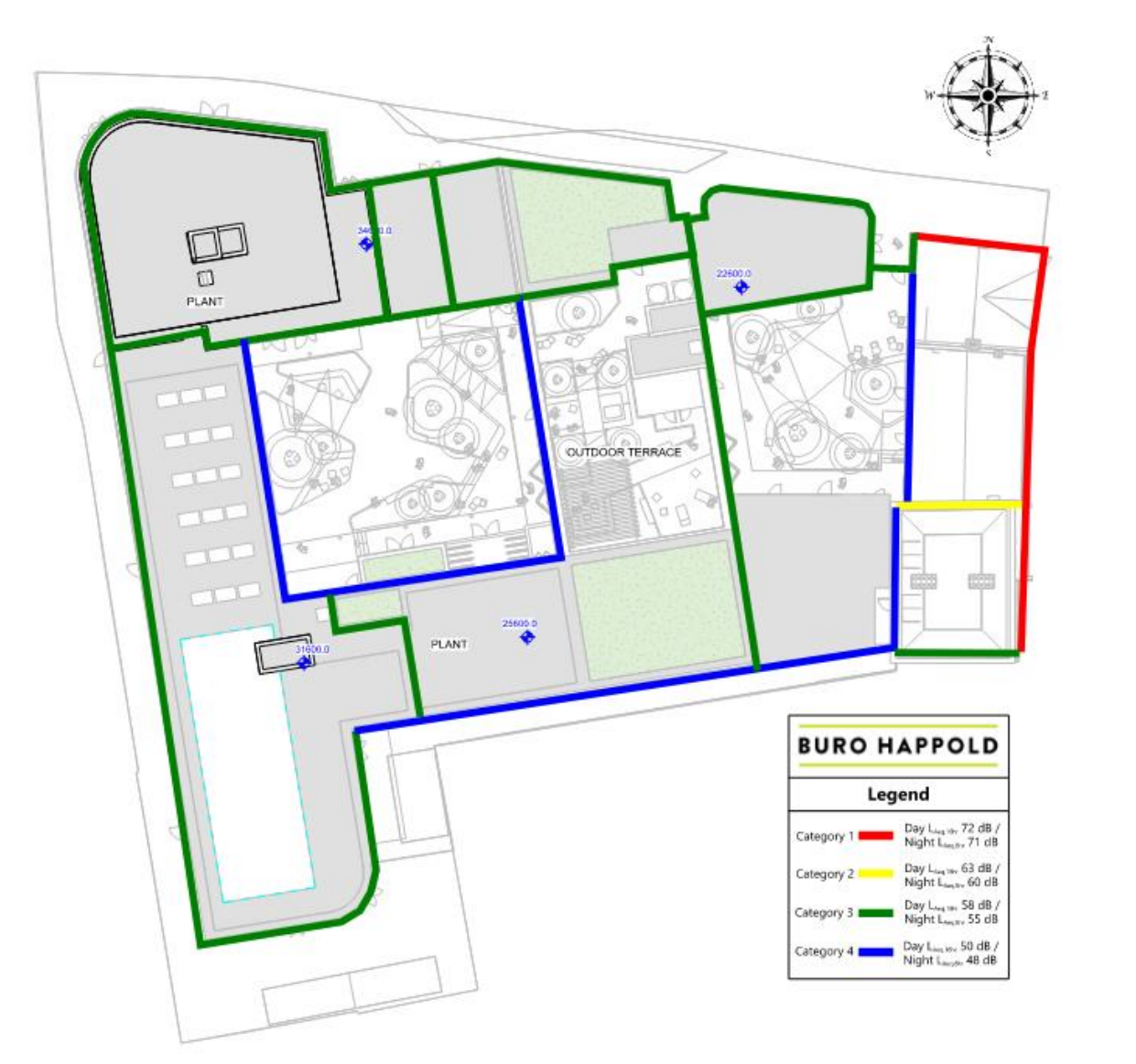


Figure 5—2 $L_{Aeq,T}$ facade design noise levels

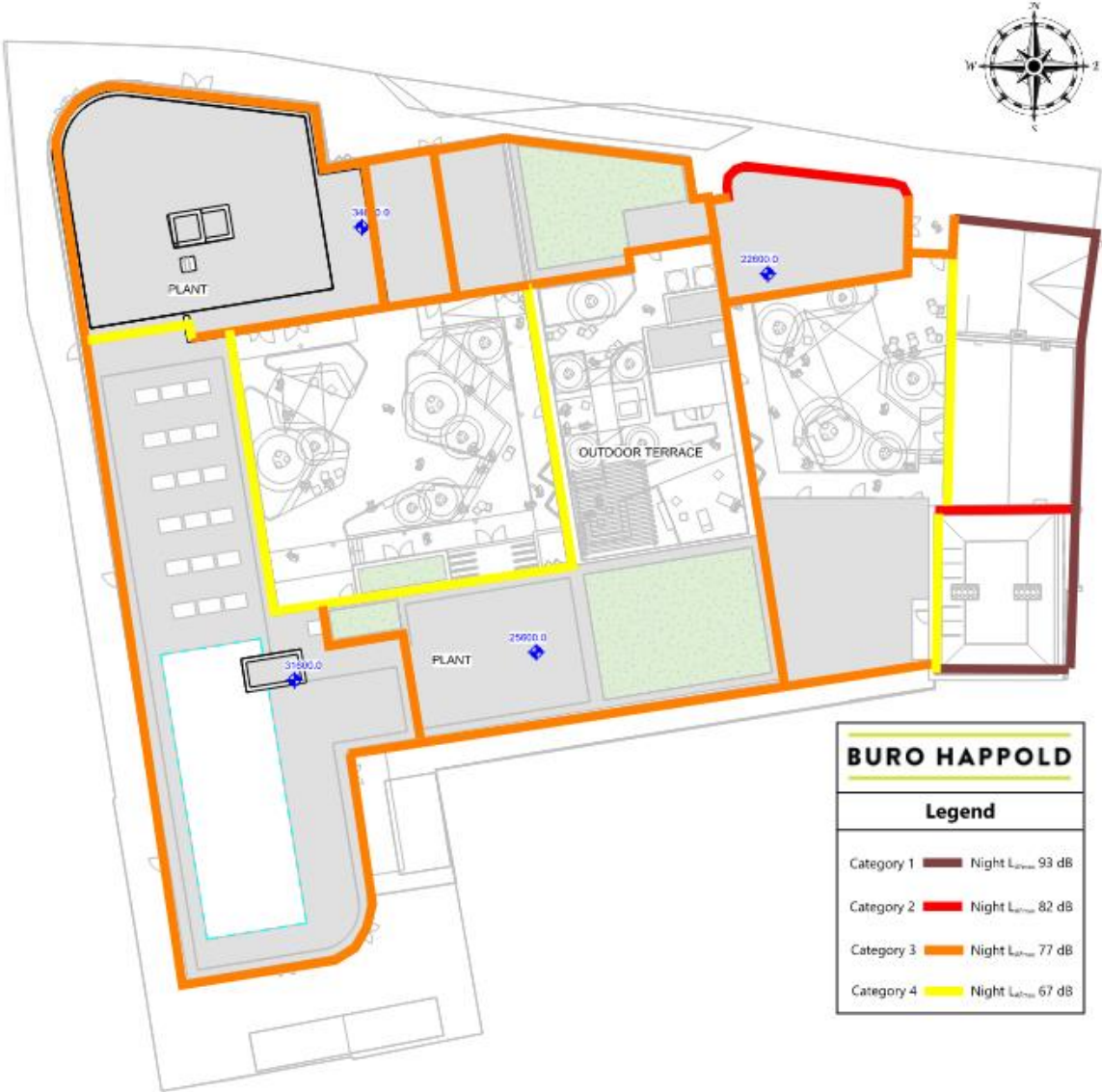


Figure 5—3 L_{Fmax} facade design noise levels

5.5 Façade Sound Insulation Requirements

Within the vast majority of traditionally-built façades (which include external masonry walls), the weakest elements of the external elevation are the glazing and ventilation systems. Normally, the specification of these elements will be the primary factor in determining the internal ambient noise level within living areas due to noise ingress from outside.

As the residential units are mechanically ventilated using an MVHR Unit, the internal ambient noise levels will primarily be determined by the performance of the glazing.

The façade acoustic requirements are given in terms of $R_w + C_{tr}$, which are described as:

- **Weighted Sound Reduction Index, R_w** – it is a single figure value which describes the standardised performance of partitions when measured in a laboratory; and
- **Correction Traffic, C_{tr}** – it is a single correction value applied which takes into account the urban traffic noise spectrum.

5.5.1 Calculation methodology

The calculation procedures follow the “more rigorous calculation method” outlined in BS 8233:2014, based on the following equation:

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{ne}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

$L_{eq,ff}$ is the equivalent continuous sound pressure level outside the room elements under consideration⁴

A_0 is a reference absorption area of 10 m² and is independent of frequency

S_f is the total façade area in square metres (m²) of the room in question

S_{wi} is the area in square metres (m²) of the windows of the room

S_{ew} is the area in square metres (m²) of the external wall of the room

S_{rr} is the area in square metres (m²) of the ceiling of the room

S is the total area in square metres (m²) of elements through which sound enters the room, i.e. $S_f + S_{rr}$

$D_{n,e}$ is the insulation of the trickle ventilator measured according to BS EN ISO 10140

R_{wi} is the sound reduction index (octave band value) of the window

R_{ew} is the sound reduction index (octave band value) of the external wall

R_{rr} is the sound reduction index (octave band value) of the roof/ceiling

A is the equivalent absorption area of the receiving room being considered

3 is a correction factor

⁴ It is the free-field sound level (i.e. in the absence of the façade), measured or estimated at the intended position of the element under consideration. It is related to the level $L_{eq,1}$ measured within a few millimetres of the actual façade by the relation $L_{eq,ff} \approx L_{eq,1} - 6$, and to the level $L_{eq,2m}$ measured 2 m away from the façade by the relation $L_{eq,ff} \approx L_{eq,2m} - 3$

5.6 Preliminary glazing requirements

The glazing assessment has been based on typical bedroom dimensions in the current scheme and the exposed façade area. The following parameters were assumed:

- Façade area (including window): 3.0 m²
- Window area: 1.0 m²
- Bedroom dimension: 2.4 m (w) x 1.0 m (l) x 2.7 (h)
- Reverberation time, T_{mf} : 0.5 s

To provide a robust assessment, a worst-case scenario was assessed whereby the most stringent acceptable IANL and worst case external noise level was considered.

Achievement of sound reduction requirements is paramount to see that the internal noise criteria is achieved. However, example glazing configurations have been provided for preliminary guidance only. An explanation of the build-ups is explained as follows:

- SGG = Saint Gobain Glass
- --/--/-- PVB interlayer = glass and air gap dimensions in mm including laminate layers e.g. 8 mm glass, 24 mm air gap, 8 mm glass with 1No. laminate layer
- Glass model = e.g. Saint-Gobain

Table 5—3 Façade glazing requirements

Category	Sound Reduction (dB) at Octave Band Centre Frequencies (Hz)						$R_w + C_{tr}$ – dB	Example glazing construction
	125	250	500	1K	2k	4k		
Category 1	38	41	46	51	53	57	46	12.8 mm PVB interlayer / 24 mm / 14.8 mm PVB interlayer Saint-Gobain
Category 2	25	25	33	44	44	49	33	6 mm/12 mm/8.4 mm interlayer (Stadip Silence) Saint-Gobain
Category 3	21	20	26	38	37	39	28	6 mm/20 mm/4 mm

As seen from the table above, the glazing requirement range from standard double glazed laminated systems to acoustically enhanced glazing requiring a significant build-up. The extent of the higher specification glazing is minimal, residences located on High Road, which is due to the intermittent max noise levels from the High Road.

The sound insulation requirements outlined above, are for the entire glazing system including the glazing and frame. It is normal to specify the glazing in terms of $R_w + C_{tr}$ however, the sound reduction in octave band centre frequencies is also important. The final glazing selection shall be submitted to the acoustic consultant for compliance.

The glazing requirements should be read in conjunction with the following figures to match the glazing requirement with the façade elevation.

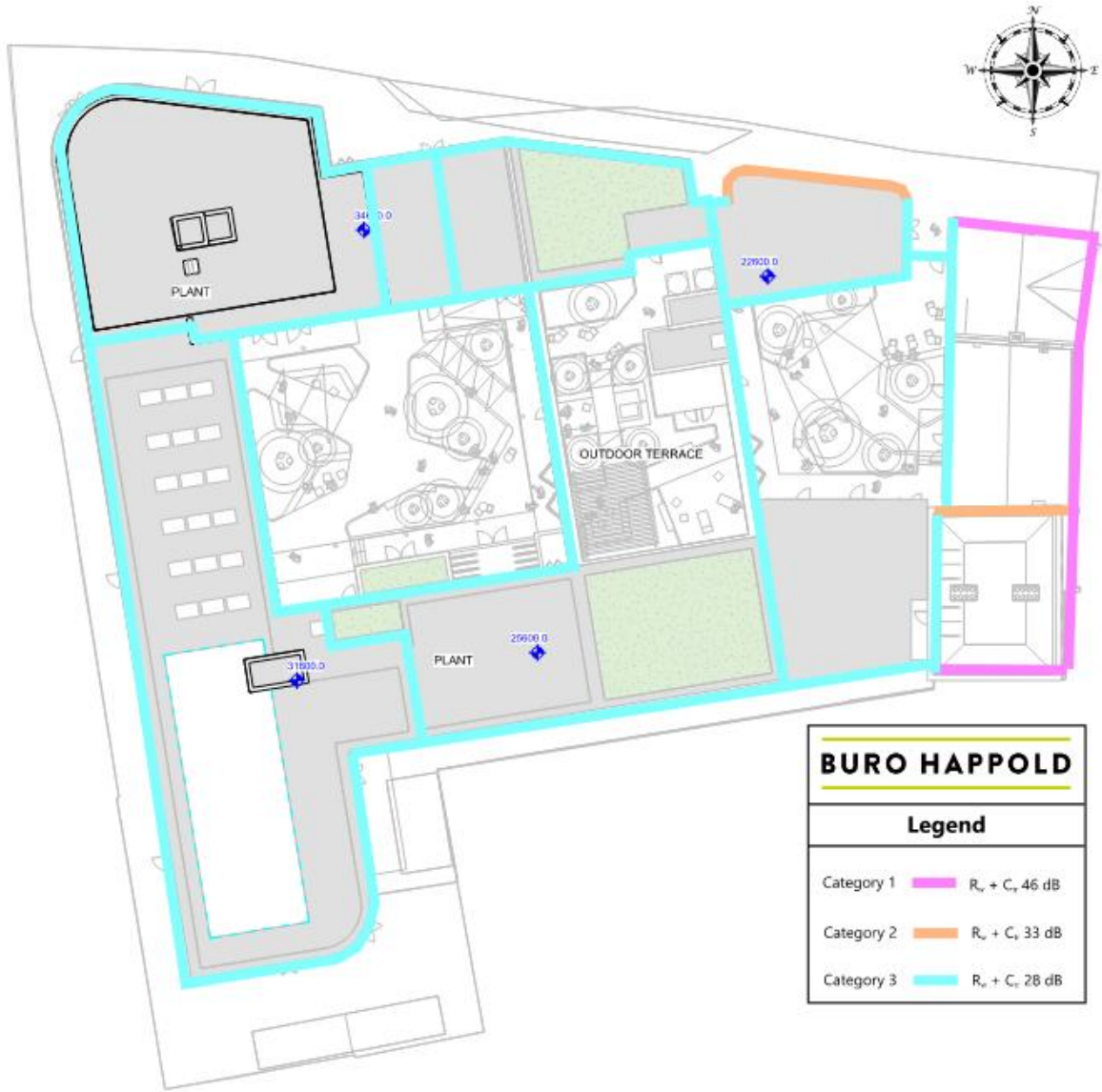


Figure 5—4 Façade glazing requirements

6 Overheating

6.1 Overview

The Building Regulation Part O deals with the topic of “Overheating” to protect the welfare of occupants.

Key dates and required actions related to Part O are presented below:

- It does not apply to work subject to a building notice, full plans application or initial notice submitted before 15 June 2022; and
- The site works on each building is to commence before 15 June 2023.

Figure 6—1 presents key effect dates from the 2021 edition of the statutory document.

2021 edition

This approved document supports Part O of Schedule 1 to the Building Regulations 2010.

This approved document takes effect on 15 June 2022 for use in England. It does not apply to work subject to a building notice, full plans application or initial notice submitted before that date, provided the work for each building is started before 15 June 2023. Full detail of the transitional arrangements can be found in Circular Letter 01/2021 published on gov.uk.

Figure 6—1 Key implementation dates (Source: Part O of the Building Regulations, 2021)

With the introduction of this new building regulation following the previous February 2022 application submission, this amendment has been added (replacing the previous AVO Guidance) to assess the Overheating in line with Part O.

6.2 Criteria

Target noise criteria presented in Part O of the Building Regulations are presented in Figure 6—2. It is key to note that this criterion is presented in terms of ambient ($L_{Aeq,T}$ dB) and maximum (L_{AFmax} dB) noise levels during the night-time period only (23:00-07:00 hours).

Noise

- 3.2** In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).
- 3.3** Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.
- 40dB $L_{Aeq,T}$ averaged over 8 hours (between 11pm and 7am).
 - 55dB L_{AFmax} , more than 10 times a night (between 11pm and 7am).
- 3.4** Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants' *Measurement of Sound Levels in Buildings* with the overheating mitigation strategy in use.

NOTE: Guidance on reducing the passage of external noise into buildings can be found in the *National Model Design Code: Part 2 – Guidance Notes* (MHCLG, 2021) and the Association of Noise Consultants' *Acoustics, Ventilation and Overheating: Residential Design Guide* (2020).

Figure 6—2 Night-time noise level criteria (Source: Part O of the Building Regulations, 2021)

An assessment of internal noise levels during what is hereafter called “the overheating condition” is presented in this section.

Table 6—1 Overheating Condition target noise limits

Period	Time Period (HH:MM-HH:MM)	Ambient noise level ($L_{Aeq,8hr}$)	Maximum noise level (L_{AFmax})
Night-time ⁵	23:00-07:00	≤ 40 dB	≤ 55 dB

6.3 Assessment of Noise Levels During the Overheating Condition

A CadnaA noise model has been completed to demonstrate the likely external ambient noise levels predicted across the elevations of the site.

⁵ As presented in Part O of the Building Regulations

6.3.1 Methodology

The following noise mapping assumptions have been made when producing the noise models for the proposed development:

- Buildings around the proposed development were input based on Open Street Map geodata;
- The proposed development was introduced as currently described in the architectural proposals;
- A worst-case ground absorption coefficient of 0 has been modelled (assuming hard reflective ground). This is a worst-case assessment condition;
- Air temperature and relative humidity have been assumed to be at typical CadnaA input levels of 10°C and 70%. CadnaA software calculates air absorption according to ISO 9613-1:1993;
- The 3D noise model has been calibrated based on noise levels captured by WSP in 2017 and 2019, and Buro Happold in 2021. All noise survey data has been input into the model and calibrated to positions representative of the real-world measurement position; and
- Typically, an uncertainty within a range of approximately ± 3 dB could be expected from computer noise modelling software.

The colour-coded elevations can be cross-referenced with suitable forms of overheating condition mitigation. These two pieces of information, in combination, identify which mitigation measures may be suitable across the different elevations of the development.

Part O presents noise level criteria for both ambient and maximum noise levels, as shown in Figure 6—2.

It is paramount to check whether ambient or maximum noise levels take precedence in driving the mitigation strategy. This dictates which noise mitigation measures could be used at that particular façade location and involves comparing the following environmental noise model outputs.

For this assessment, the level of difference across a façade with an **open window** is 4 dB. This performance has been taken from the joint publication from the Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA) *Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O* and is based on the window openings necessary to satisfy the simplified method of AD-O for developments in dense cities such as London.

6.3.2 Ambient noise levels

This section presents the likely appropriate mitigation measures that could be used across the various facades of the development when the **ambient** noise Part O requirement takes precedence.

For reference:

- The **ambient noise** ($L_{Aeq,8hr}$) level CadnaA model, colour coded to create “façade zones”, is presented in Figure 6—3; and
- A table of likely appropriate mitigation measures which could be applied to the façade zones as described above is presented in Table 6—2.

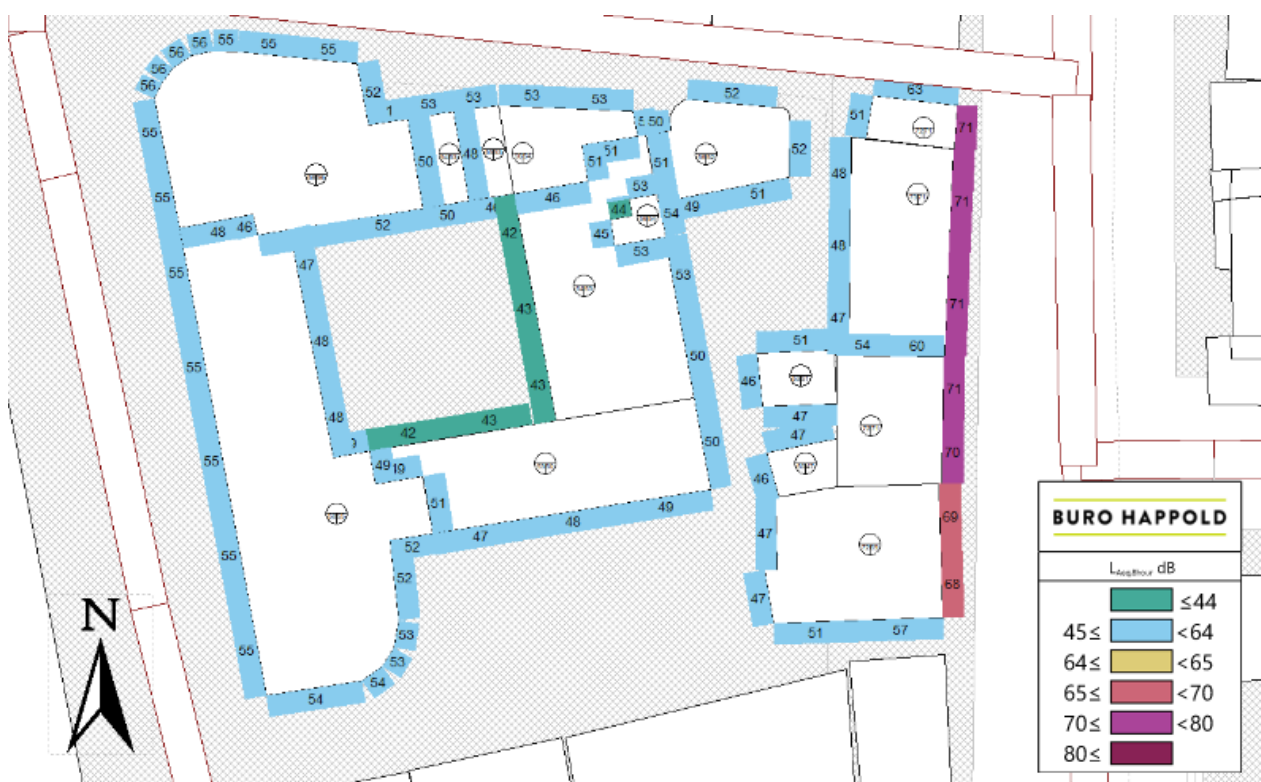


Figure 6—3 Overheating Condition façade zones for ambient noise levels for The Printworks

Table 6—2 Noise mitigation measures that could be suitable when ambient ($L_{Aeq,8hr}$ dB) noise levels take precedent

Façade zone	Façade incident noise level $L_{Aeq,8hr}$ dB	Approximate level difference required (dB) to comply with ADO criteria ⁶
1	$\geq 80^7$	40+ ⁷
2	70-79	30-39
3	65-69	25-29
4	64	24
5	45-63	5-23
6	≤ 44	4 ⁸

⁶ Source: Acoustics, Ventilation and Overheating Guide, ANC⁷ Mitigation measure would be limited based on the façade performance and would require testing⁸ Source: Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O, ANC

6.3.3 Maximum Noise Levels

This section presents the likely appropriate mitigation measures that could be used across the various facades of the development when the **maximum** noise Part O requirement takes precedence.

For reference:

- The **maximum noise ($L_{AF,max}$ dB)** colour coded façade zones produced using the CadnaA model is presented in Figure 6—4; and
- A table of likely appropriate mitigation measures which could be applied to the façade zones as described above is presented in Table 6—3.

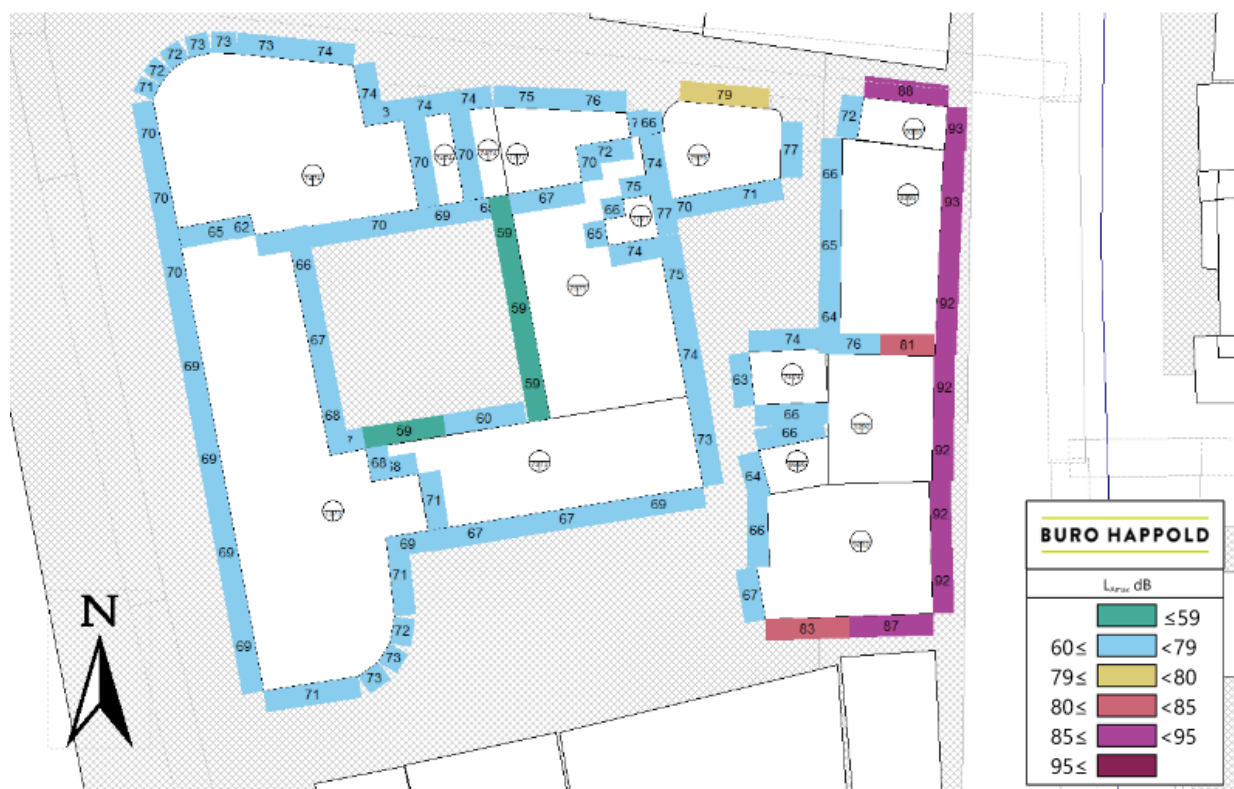


Figure 6—4 Overheating Condition façade zones for maximum noise levels for The Printworks

Table 6—3 Noise mitigation measures that could be suitable when maximum ($L_{AF,max}$ dB) noise levels take precedent

Façade zone	Façade incident noise level $L_{AF,max}$ dB	Approximate level difference required (dB) to comply with ADO criteria ⁹
1	$\geq 95^{10}$	40+ ¹⁰
2	85-94	30-39
3	80-84	25-29
4	79	24
5	60-78	14-23
6	≤ 59	4 ¹¹

6.4 Discussion

Mark-ups demonstrating where suitable mitigation measures may be suitable to achieve ADO target criteria are presented in Figure 6—5. This has been compiled based on a review of the ambient and maximum noise models.

As seen the majority of the building is within Zone 5, where open windows, solely, are not expected to satisfy the noise conditions as part of Part O. Additional mitigation such as sound-attenuating balconies, MVHR cooling, or the other measures presented would be required.

A key of suitable mitigation measures is presented in Table 6—4.

⁹ Source: Acoustics, Ventilation and Overheating Guide, ANC

¹⁰ Mitigation measure would be limited based on the façade performance and would require testing

¹¹ Source: Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O, ANC

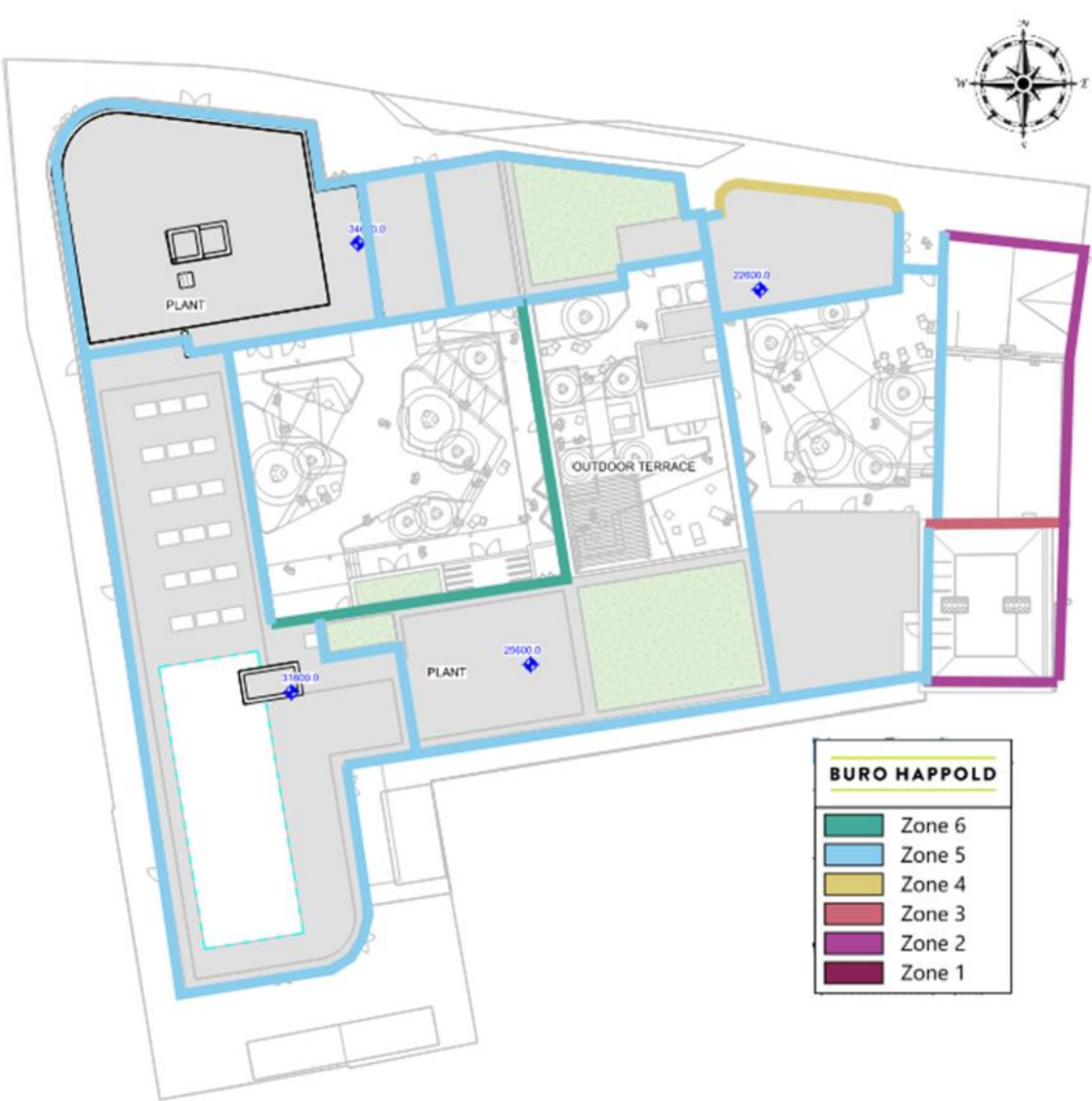


Figure 6—5 Acoustic mitigation measure mark-up for The Printworks

Table 6—4 Noise mitigation measures that could be suitable to achieve ADO internal noise level targets

Façade zone	Noise mitigation options that may achieve ADO $L_{AF,max}$ 55 dB target
1	• Mechanical comfort cooling, or • MVHR booster cooling unit
2	• Mitigation options listed above, or • Attenuated windows or vents/louvres with sound-attenuating balconies
3	• Mitigation options listed above, or • Attenuated vents/louvres
4	• Mitigation options listed above, or • Attenuated or plenum windows
5	• Mitigation options listed above, or • Open windows with sound-attenuating balconies
6	• Mitigation options listed above, or • Open windows

6.5 Mitigation Options

Drawings and photographs of various overheating mitigation options identified in the sections above are shown in Figure 6—6 to Figure 6—9.

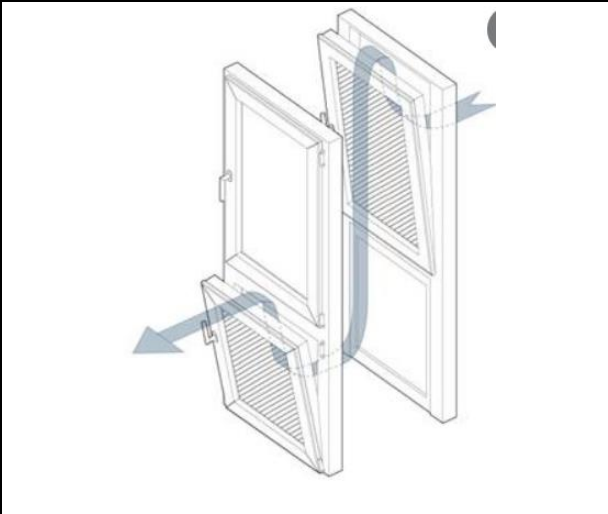


Figure 6—6 Plenum / Hafencity windows

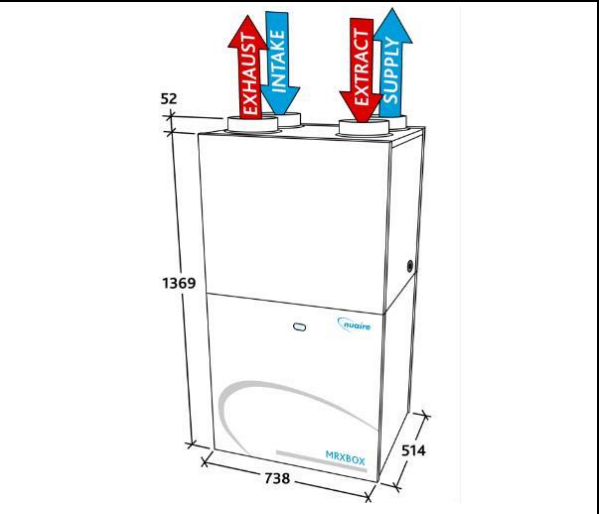


Figure 6—7 MVHR booster cooling unit (source: Nuaire)

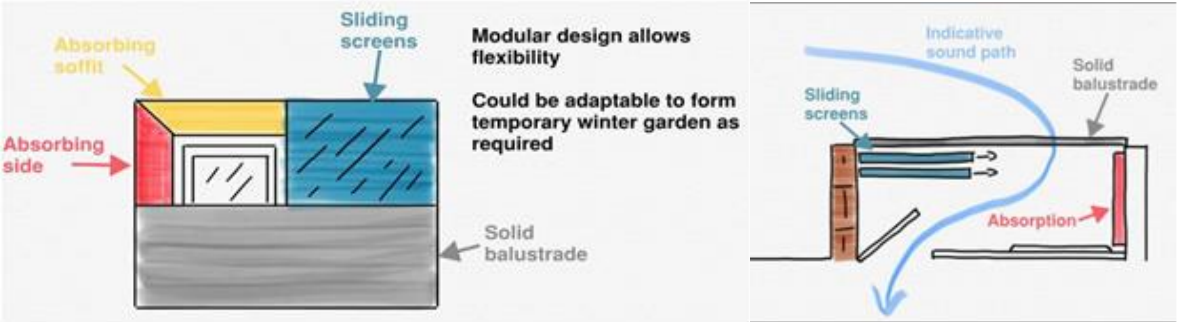


Figure 6—8 Attenuated balcony concepts



Figure 6—9 Operable attenuated louvre

6.6 Conclusion

Figure 6—5 demonstrate that the following mitigation measures should be able to achieve the ADO noise criteria:

For elevations in the 2 zone:

- Mechanical comfort cooling;
- MVHR booster cooling unit; and
- Attenuated windows or vents/ louvres with sound attenuating balconies.

For elevations in the 3 zone:

- Mechanical comfort cooling;
- MVHR booster cooling unit;
- Attenuated windows or vents/louvres with sound attenuating balconies; and
- Attenuated vents/louvres.

For elevations in the 4 zone:

- Mechanical comfort cooling;
- MVHR booster cooling unit;
- Attenuated windows or vents/ louvres with sound attenuating balconies;
- Attenuated vents/louvres; and
- Attenuated or plenum windows.

For elevations in the 5 zone:

- Mechanical comfort cooling;
- MVHR booster cooling unit;
- Attenuated windows or vents/ louvres with sound attenuating balconies;
- Attenuated vents/louvres;
- Attenuated or plenum windows; and
- Open windows with sound attenuating balconies.

For elevations in the 6 zone:

- Mechanical comfort cooling;
- MVHR booster cooling unit;
- Attenuated windows or vents/louvres with sound attenuating balconies;
- Attenuated vents/louvres;
- Attenuated or plenum windows;
- Open windows with sound attenuating balconies; and
- Open windows.

7 Plant Noise Limits

7.1 Introduction

This section outlines the mechanical plant noise limits to meet the requirements of the Local Planning Authority. At this stage, specific plant locations and selections have not been finalised, and the most robust method in terms of controlling noise output will be to set limits for noise impact on existing noise-sensitive receptors (NSRs) in the vicinity of the site.

7.2 Acoustic Design Criteria – Plant Noise Limits

7.2.1 Haringey Council requirements

As discussed in Section 2.4, there has not been a response from the Haringey Environmental Health Office with regards to the assessment methodology and more specifically, the limiting plant noise levels from the Site to existing noise-sensitive receptors. However, as the previous scheme was approved, there should not be

The plant noise limits that are typically adopted by Local Authorities in London is proposed. These limits are within the boundaries set out in the London Plan (Policy D14). Importantly, they are also consistent with the position approved by the Council for the extant consesnt at the site.

7.3 Noise Sensitive Receptors

The proposed development is surrounded by noise-sensitive receptors (NSRs) as shown in Figure 7—1. The NSRs are in the form of residential dwellings.

7.4 Background Sound Level

Background sound levels measured at targeted positions can be found in Section 3.4 of this report. The following sections highlight which measurement locations represent the background sound level at the identified NSRs.

7.4.1 Long Term 1 (LT1)

Background sound levels taken at LT1 are considered representative of the background sound level at the NSRs located to the east of the rail line.

7.4.2 Location ST 4

A short term background sound level was undertaken north of Printworks. The location is considered to be representative of the background sound level at the NSRs located to the north.

7.4.3 Location ST 5

A short term background sound level was undertaken along White Hart Lane to the south of Printworks. The location is considered to be representative of the background sound level at the NSRs located to the south.

7.4.4 Location ST 6

A short term background sound level was undertaken along High Road to the east of the Printworks. The location is considered to be representative of the background sound level at the NSRs neighbouring Printworks.

7.4.5 Summary background sound levels

The background sound levels measured at ST 4, 5, and 6 are only a short snapshot of the background levels around the proposed development site. In contrast, measurements at LT 1 were taken over an extended period and therefore considered a better representation of the typical background sound level around the development site.



Figure 7—1 Noise sensitive receptor and measurement locations

The short-term sound levels measured at ST 4, 5, and 6 were louder than the results measured to LT 1 during the day and night-time period. This is primarily due to LT1 being shielded from noise sources such as road traffic from the High Road and White Hart Lane. Furthermore, the NSRs to the north, east and south are located directly adjacent to arterial roads. Therefore, typical background sound levels are anticipated to be higher.

With this in mind, the typical background sound level measured at LT 1 has been adopted across all NSRs around the proposed development site. This should provide a robust level of assessment as a lower background sound level equates to lower plant noise limits.

7.5 Plant Noise Limits at the Nearest NSRs

At this stage, specific plant locations and selections have not been finalised, and the most robust method in terms of controlling noise output will be to set limits for noise impact on existing noise-sensitive receptors (NSRs) in the vicinity of the site.

A commonly adopted plant noise limit adopted by Local Authorities across London is for the rating noise level of fixed plant, $L_{Ar,T}$ (dB), to be at least 50 dB below the 'typical' background sound level ($L_{A90,T}$) when assessed at the nearest NSR. Based on the measured background sound levels during the day and night-time periods, limiting plant noise levels at the nearby noise sensitive receptors have been set in Table 7—1.

It should be noted that correction factors may need to be applied for noise sources that contain certain acoustic features such as the tonality, impulsivity, and intermittency, in general accordance with BS4142:2014. BS 4142 states that this is normally possible to carry out a subjective assessment of characteristics, based on the following correction guidelines:

- **Tonality:** +2 dB for a 'just perceptible' tone, +4 dB for 'clearly perceptible', and rising to +6 dB for 'highly perceptible' tones
- **Impulsivity** (rapidity of change and overall change in level): +3 dB for 'just perceptible' impulsivity, +6 dB for 'clearly perceptible', rising to +9 dB for 'highly perceptible' impulsivity
- **Intermittency:** if the on/off-time of the specific sound is readily distinctive at the noise-sensitive receivers, +3 dB
- **Other sound characteristics:** (see page 14 or 20 in PDF file of 4142)

7.5.1 Plant noise limits at the nearest external amenity spaces of the Site

In addition to the local authority requirements above, plant noise limits should consider the development itself, to ensure that a reasonable level of noise amenity can be achieved. This applies to external amenity areas such as balconies and ground floor amenity spaces.

BS 8233:2014 states that it is desirable that the steady noise level in external amenity areas (such as gardens or outdoor living areas) does not exceed $L_{Aeq,T}$ 50 dB, with $L_{Aeq,T}$ 55 dB being acceptable in noisier environments. This is in line with recommendations given in the WHO Guidelines for Community Noise.

Table 7—1 Limiting plant noise levels at the nearest existing NSRs

Period	Typical measured existing background noise level (L_{A90})	Plant noise limits from the Site: Max. L_{Ar} dB @ 1 m from affected façade
Daytime hours (07:00 – 23:00)	42	37
Night-time hours (23:00 – 07:00)	39	34

8 Conclusion

8.1 Design Criteria

Design criteria for the development have been set, based on relevant British Standard documentation, guidelines for noise control contained within the London Plan and Haringey Development Management DPD.

8.1.1 Agent of Change (London Plan Policy D13)

A thorough noise survey was undertaken to assess the existing ambient and background sound environment, which includes the noise sources from existing developments. The design of this development is based on the aforementioned noise survey and therefore takes into consideration the existing developments. Glazing specifications and overheating analysis takes into consideration the existing noise environment and is designed accordingly.

8.2 Noise Survey

An acoustic survey was conducted by WSP with supplementary surveys carried out by Buro Happold in the vicinity of the development site to assess the existing noise climate. The WSP locations are considered to be acceptable for this assessment as measurement position ST 1 is the noise due to the railway that will impinge on the western side of the development. Measurement positions ST 2 and ST 3 are indicative of the traffic flow noise along High Road.

8.3 Façade Assessment

In terms of noise break-in, the noise-sensitive areas of the proposed development (notably the residences apartments) are proposed to be provided with full mechanical supply and extract ventilation, limiting the ingress of noise via openings in the façade. In addition, robust laminated glass is specified (refer to Table 5—3) to control noise levels to within acceptable levels outlined in BS 8233.

8.4 Plant Noise Impact

Plant noise limits set 5 dB below the typical background level have been proposed to which, given the context of the site, will have No Observed Effect Level at existing noise sensitive receivers. In the absence of specific plant locations and selections, fixed plant noise limits have been identified at existing noise-sensitive receivers. These limits are based on a BS 4142 assessment of typical background sound level.

8.5 Part O Assessment

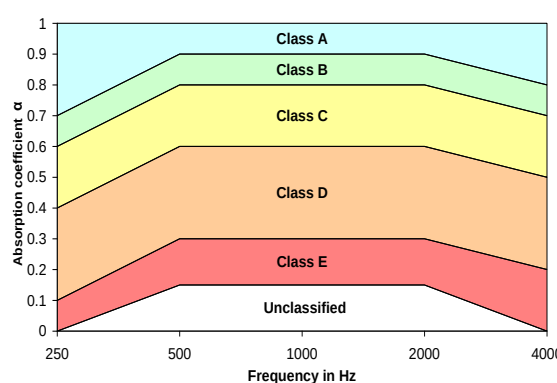
A study was carried out to assess the effects of open windows to mitigate overheating. The majority of the building is not suited for open windows, solely, as an overheating strategy, therefore the use of MVHR units providing cooling to student clusters, as a part of the MEP ventilation strategy, is expected to be a suitable solution.

8.6 Summary

The Site is considered suitable and satisfies the planning policies outlined in Section 2 of this report, provided that the mitigation measures detailed above are satisfactorily implemented. Therefore, acoustic concerns are not considered to represent any barrier to development.

Appendix A Acoustic Glossary

Term	Definition
α (α_w)	Sound Absorption Coefficient (Weighted Sound Absorption Coefficient) is a measure of the effectiveness of materials as sound absorbers as defined in BS EN ISO 11654:1997. It is the ratio of the sound energy absorbed or transmitted (i.e. not reflected) by a surface to the total sound energy incident upon that surface. The value of the coefficient varies from 0 (perfect reflector) to 1 (perfect absorber).
Ambient Noise (as defined in BS 4142:2014+A1 2019)	Totally encompassing noise in a given situation at a given time; it is usually composed of noise from many sources, near and far.
Background Noise (as defined in BS 4142:2014+A1 2019)	A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using the Fast time weighting and quoted to the nearest whole number of decibels.
C _{tr}	Spectrum adaptation term calculated using traffic noise as described in BS EN ISO 717-1:2013. This term is provided with weighted single values such as $D_{nT,w}$ or R_w to match with particular requirements (building acoustic or traffic noise spectrum).
Decibel, dB	Decibel (dB) is a dimensionless unit commonly used to demonstrate sound levels. It is derived from the logarithm of the ratio between the measured level and the reference value. For sound pressure level (L_p) the reference value is 2×10^{-5} pascals. For sound power (L_w) reference value is 1×10^{-12} Watts.
$D_{nT,w}$	The Weighted Standardised Level Difference ($D_{nT,w}$) is defined in BS EN ISO 140-4:1998 (superseded by BS EN ISO 16283-1:2014+A1:2017 but still cited in The Building Regulations) BS EN ISO 717-1:2013. This performance describes the installed site performance of the composite separating constructions, including the partition element performance, the flanking path transmission and the reception room reverberation time factors. $D_{nT,w}$ target leads to a selection of adequate construction elements and methods to build the partition that are rated using weighted sound reduction index R_w . It is typically standardised to a reverberation time (T_0) of 0.5 seconds. In the instance of testing in schools, T_0 is taken as the room's T_{mf} .
Flanking Noise	The transmission of sound around the perimeter or through holes within partitions (or barriers) that reduces the otherwise obtained sound transmission loss of a partition. Examples of flanking paths within buildings are ceiling plenum above partitions or raised floor cavities, ductwork, piping, and electrical conduit penetrations through partitions, back to back electrical boxes within partitions, window mullions, etc.
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
IANL	Indoor Ambient Noise Level. For schools Table 1 in BB93 (2015) specifies the upper limit for indoor ambient noise levels within teaching areas. The design criteria is set for a 30-minute average level (i.e. $L_{Aeq,30mins}$). However, where there is negligible change in the noise level, BB93 states that a much shorter time period (e.g. $L_{Aeq,5min}$) can be used. BB93 also states that for rooms identified having limits of $L_{eq,30min}$ 35 dB(A) or less, the noise should not regularly exceed $L_{1,30min}$ 55 dB(A).
$L_{90,T}$ ($L_{A90,T}$)	Sound pressure level exceeded for 90% of the measurement period. Referred to as background noise level.
$L_{Ar,T}$	Rating Noise Level (as defined in BS 4142:2014+A12019), the specific noise level plus any adjustment for the characteristic features of the noise.

Term	Definition
$L_{eq,T}$ ($L_{Aeq,T}$)	The equivalent continuous noise level of a time-varying noise. It is the steady noise level which, over the period of time under consideration, contains the same amount of sound energy as the time-varying noise over the same period of time.
$L_{Fmax,T}$ ($L_{AFmax,T}$)	The maximum sound pressure level measured during the measurement period T using the fast time constant.
$L'_{nT,w}$	Weighted Standardised Impact Sound Pressure Level: a single-figure value of impact sound insulation performance. This European index is described in BS EN ISO 140-7:1998 (superseded by BS EN ISO 16283-2:2015 but still cited in The Building Regulations) and BS EN ISO 717-2:2013, used for comparing and rating floors and based on the values of L'_{nT} at different frequencies. $L'_{nT,w}$ target leads to a selection of adequate construction elements and methods to build the floor that are rated using weighted normalised impact sound pressure level $L_{n,w}$. The lower the $L'_{nT,w}$ the better the performance
$L_{n,w}$	Weighted Normalized Impact Sound Pressure Level: European single figure rating for transmission loss of impact sound through building elements as described in BS EN ISO 10140-3:2010+A1:2015 and BS EN ISO 717-2:2013. The lower the $L_{n,w}$ the better the performance.
L_p	Sound pressure level, in decibels, of a sound is 20 times the logarithm to the base of 10 of the ratio of the sound pressure to the reference pressure (2×10^{-5} pascals). The reference pressure shall be explicitly stated and is defined by standard.
Noise Rating (NR)	Curves developed by the International Organization for Standardization (ISO) to determine the acceptable indoor environment for hearing preservation, speech communication and annoyance. These can be compared to NC curves and also can be approximated to equivalent dB(A) levels.
Reverberation Time (RT)	Time required for the steady sound pressure level in an enclosed space to decay by 60 dB, measured from the moment the sound source is switched off. Reverberation time is described in ISO 354:2003.
R_w (C , C_{tr})	Weighted Sound Reduction Index: Single-figure value of sound reduction according to BS EN ISO 10140-2:2010 used for rating partition systems, door-sets or glazing, based on the values of sound reduction index R at different frequencies. The higher the R_w the better the performance.
Sound absorption classes	Sound absorption performance characteristics are defined by a class. Below is a diagram of the different classes of absorption available, taken from BS EN ISO 11654:1997. The y-axis is the absorption coefficient of the material with one being total absorption and zero being no absorption. The x-axis is the frequency of the sound.  The diagram is a line graph with 'Absorption coefficient α' on the y-axis (ranging from 0 to 1) and 'Frequency in Hz' on the x-axis (logarithmic scale with markers at 250, 500, 1000, 2000, and 4000). The graph shows six stacked regions representing different absorption classes. From top to bottom, they are: Class A (light blue), Class B (light green), Class C (yellow), Class D (orange), Class E (red), and Unclassified (white). Each class represents a range of absorption coefficients across the frequency spectrum. Class A has the highest absorption, while the Unclassified region has the lowest.
Specific Noise Level (as defined in BS 4142:2014+A1 2019)	The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.
T_{mf}	Mid Frequency Reverberation Time: Within BB93, the reverberation time criteria are set in terms of the averaged value of the 500 Hz, 1000 Hz and 2000 Hz frequency bands. The various levels for T_{mf}

Term	Definition
	are specified within Table 6 of BB93 (2015) and are generally upper limits. Usually the specified mid-frequency reverberation times are for 'finished but unoccupied and unfurnished rooms'.
Weightings (as defined in BS EN 61672:2013):	A-Weighting: Frequency weighting devised to attempt to take into account the fact that human response to sound is not equally sensitive to all frequencies; it consists of an electronic filter in a sound level meter, which attempts to build in this variability into the indicated noise level reading so that it will correlate, approximately, with human response.). C-Weighting: One of the frequency weightings corresponding to the 100-phon contour and the closest to the linear or un-weighted value.

Appendix B Façade sound insulation calculations

FAÇADE BREAK-IN CALCULATION									
Project Name	THFC - Printworks					BURO HAPPOLD			
Room or space	Category 1								
Date	230714								
ROOM CONSTANT & FAÇADE AREA									
Façade area (incl. window)	3.0 m ²	Area of the external wall	2 m ²	Room reverberation time (s)					
Area of the louver	0.0 m ²			Trmf	125Hz	250Hz	500Hz	1kHz	2kHz
Area of the windows	1.0 m ²	Area of exposed envelope	5 m ²	0.5	0.5	0.5	0.5	0.5	0.5
Area of the roof/ceiling	2.4 m ²								
Room Depth (x)	2.4 m	Room Volume	6 m ³						
Room Width (y)	1.0 m								
Ceiling height (z)	2.7 m								
DISTANCE ATTENUATION CALCULATION									
Distance correction	No	Calculated Distance Attenuation	-						
Type of distance correction	Line source								
Distance from source to microphone	-								
Distance from source to receiver	-								
FREE FIELD LEVELS AT 1m FROM THE NOISE SENSITIVE FAÇADE									
LAeq	Free Field Leq in octave bands (dB)	dB(A)	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
	Resultant Free-Field Leq with distance attenuation (dB(A))	71	73	69	67	67	63	58	
LAmax (if applicable)	Free Field Lfmax in octave bands	dB(A)	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
	Resultant Free-Field LAmax with distance	93	95	91	89	89	85	80	
SOUND REDUCTION PROPERTIES OF BUILDING ELEMENTS									
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	R _w	R _w + C _{tr} (dB)
Window (R _w)	R _w +Ctr 46dB SGG 12 PVB interlayer (2no.)/24/14 PVB interlayer (2no.)	38	41	46	51	53	57	50	46
Louver (R _w)	No Louver	0	0	0	0	0	0	0	0
External wall Construction (R _w)	Typical external wall construction	46	44	46	54	62	67	52	49
Roof Construction (R _w)	Typical roof construction	99	99	99	99	99	99	99	99
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	D _{s, rw}	(dB)
Trickle Vent (D _{s, rw})	No Vent	200	200	200	200	200	200	-	-
	0 Units	200	200	200	200	200	200	-	-
CALCULATED INTERNAL LAeq AND LAF,max LEVELS									
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz		
Calculated LAeq in the receiver room (dB)		36	31	25	19	11	1		
Calculated LAFmax in the receiver room (dB)		54	49	43	37	29	19		
		LAeq (125-4000Hz)					LAmax (125-4000Hz)		
		27 dB(A)					45 dB(A)		

FAÇADE BREAK-IN CALCULATION												
Project Name	THFC - Printworks					BURO HAPPOLD						
Room or space	Category 2											
Date	230714											
ROOM CONSTANT & FAÇADE AREA												
Façade area (incl. window)	3.0 m ²		Area of the external wall	2 m ²	Room reverberation time (s)							
Area of the louver	0.0 m ²				Room reverberation time (s)	Tmf	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Area of the windows	1.0 m ²											
Area of the roof/ceiling	2.4 m ²		Area of exposed envelope	5 m ²	0.5	0.5	0.5	0.5	0.5	0.5		
Room Depth (x)	2.4 m											
Room Width (y)	1.0 m											
Ceiling height (z)	2.7 m		Room Volume	6 m ³								
DISTANCE ATTENUATION CALCULATION												
Distance correction	No		Calculated Distance Attenuation	-								
Type of distance correction	Line source											
Distance from source to microphone	-											
Distance from source to receiver	-											
FREE FIELD LEVELS AT 1m FROM THE NOISE SENSITIVE FAÇADE												
LAeq	Free Field Leq in octave bands (dB)		dB(A)	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz			
	Resultant Free-Field Leq with distance attenuation (dB(A))		60	62	58	56	56	52	47			
LAmax (if applicable)	Free Field Lfmax in octave bands		dB(A)	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz			
	Resultant Free-Field LAmax with distance		82	84	80	78	78	74	69			
SOUND REDUCTION PROPERTIES OF BUILDING ELEMENTS												
			125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	Rw	Rw + Ctr (dB)		
Window (Rw)	Rw + Ctr 33dB SGG 6/12/8.4 (Stadip Silence)		25	25	33	44	44	49	38	33		
Louver (Rw)	No Louver		0	0	0	0	0	0	0	0		
External wall Construction (Rw)	Typical external wall construction		46	44	46	54	62	67	52	49		
Roof Construction (Rw)	Typical roof construction		99	99	99	99	99	99	99	99		
Trickle Vent (Dn,ext)	No Vent		200	200	200	200	200	200	200	-		
CALCULATED INTERNAL LAeq AND LAF,max LEVELS												
			125Hz	250Hz	500Hz	1kHz	2kHz	4kHz				
Calculated LAeq in the receiver room (dB)			37	33	23	13	8	-2				
Calculated LAFmax in the receiver room (dB)			55	51	41	30	26	16				
			L_{avg} (125-4000Hz) 27 dB(A)				L_{max} (125-4000Hz) 45 dB(A)					

FAÇADE BREAK-IN CALCULATION													
Project Name		THFC - Printworks				BURO HAPPOLD							
Room or space		Category 3											
Date		230714											
ROOM CONSTANT & FAÇADE AREA													
Façade area (incl. window)		3.0 m ²		Area of the external wall		2 m ²		Room reverberation time (s)					
Area of the louver		0.0 m ²				T _{mf} 125Hz 250Hz 500Hz 1kHz 2kHz 4kHz							
Area of the windows		1.0 m ²		Area of exposed envelope		5 m ²		0.5 0.5 0.5 0.5 0.5 0.5					
Area of the roof/ceiling		2.4 m ²											
Room Depth (x)		2.4 m		Room Volume		6 m ³							
Room Width (y)		1.0 m											
Ceiling height (z)		2.7 m											
DISTANCE ATTENUATION CALCULATION													
Distance correction		No		Calculated Distance Attenuation		-							
Type of distance correction		Line source											
Distance from source to microphone		-											
Distance from source to receiver		-											
FREE FIELD LEVELS AT 1m FROM THE NOISE SENSITIVE FAÇADE													
LAeq		Free Field Leq in octave bands (dB)		dB(A)		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz		
		Resultant Free-Field Leq with distance attenuation (dB(A))				55	57	53	51	51	47	42	
LAmax (if applicable)		Free Field Lfmax in octave bands		dB(A)		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz		
		Resultant Free-Field LAmax with distance				77	79	75	73	73	69	64	
SOUND REDUCTION PROPERTIES OF BUILDING ELEMENTS													
						125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	R _w = C _r	
Window (R _w)		R _w = C _r 28dB BS12354 6/20/4				21	20	26	38	37	39	32	28
Louver (R _w)		No Louver				0	0	0	0	0	0	0	0
External wall Construction (R _w)		Typical external wall construction				46	44	46	54	62	67	52	49
Roof Construction (R _w)		Typical roof construction				99	99	99	99	99	99	99	99
						125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	D _{o,iso} (dB)	
Trickle Vent (D _{o,iso})		No Vent		0 Units		200	200	200	200	200	200	-	-
CALCULATED INTERNAL LAeq AND LAF,max LEVELS													
						125Hz	250Hz	500Hz	1kHz	2kHz	4kHz		
Calculated LAeq in the receiver room (dB)						36	33	25	13	10	3		
Calculated LAFmax in the receiver room (dB)						54	51	43	31	28	21		
						L _{Aeq} (125-4000Hz)			L _{Amax} (125-4000Hz)				
						27 dB(A)			45 dB(A)				

Appendix C BS 4142:2014+A1-2019 Methods for rating and assessing industrial and commercial sound

BS 4142:2014+A1-2019 Methods for rating and assessing industrial and commercial sound

BS 4142:2014 provides methods for rating and assessing sound of an industrial and/or commercial nature, which includes sound from industrial and manufacturing processes, fixed services plant, sound generated by the loading/unloading of goods and sound from mobile plant / vehicles associated with industrial / commercial premises (e.g. forklift trucks).

The standard utilises various descriptors to assess complaints, the impact of sound associated with proposed industrial / commercial activities on existing noise-sensitive receptors, or the impact and likely suitability of siting new noise-sensitive receptors in the vicinity of existing industrial / commercial noise sources.

The standard is specifically precluded from being used to determine likely internal sound levels arising from external noise, or from the assessment of various sound sources for which other (more relevant) guidance exists, including music/entertainment noise, person noise and construction noise.

The magnitude of impact is assessed by subtracting the measured background sound level at a location representative of the nearest noise-sensitive receptor, from the 'L_{Ai} level' (the specific sound source to be introduced into the locality, corrected for acoustically distinguishing characteristics which may make it more subjectively prominent).

Typically, the greater the difference between the background and rating level, the greater the magnitude of impact, although BS 4142 emphasises that this is highly context-specific.

As a guideline, BS 4142 states that:

- A difference (between the background and rating level) of around +10 dB or more is likely to be indicative of significant adverse impact, depending on context
- A difference (between the background and rating level) of around +5 dB or more is likely to be indicative of adverse impact, depending on context
- The lower the rating level relative to the background level, the less likely it is that the specific sound will have an adverse impact
- Where the rating level does not exceed the background level, this is an indication that the specific sound will have a low impact, depending on the context

It should be noted that BS 4142:2014 draws a clear distinction between the detailed and flexible assessment methods contained within, and the more limited versions contained in the previous (1997) edition.

Above all, BS 4142:2014 requires qualified engineering consultants and technical planning professionals (e.g. Environmental Health Officers) to use a combination of quantitative assessment techniques and rational qualitative judgements to come to a reasoned conclusion.

Definitions

BS 4142 uses several specific terms to define the various levels used in assessments, as follows:

- **Specific sound** – the commercial / industrial noise source under consideration
- **Residual sound** – the sound level at the noise-sensitive receivers in the absence of the specific sound
- **Ambient sound** – the sound level at the noise-sensitive receivers in the presence of the specific sound (i.e. ambient = residual + specific)
- **Background level** – the sound pressure level which is exceeded by the residual sound for 90% of the measurement period
- **Rating level** – the specific sound, corrected for acoustically distinguishing characteristics

Background level

BS 4142 emphasises that the background level ($L_{A90,T}$) is, in fact, a range of levels, not one absolute value. Whilst stating that the measurements of background sound should be normally not less than 15 mins, the focus is on obtaining a level for use in assessment that is representative of typical conditions at the noise-sensitive receivers.

Specific sound

BS 4142 requires that the specific sound ($L_{Aeq,T}$) is obtained over a reference period of 1 hour (daytime) and 15 mins (at night). Ideally, measurements would be taken of the ambient sound and residual sound at the assessment location, with these measurements used to accurately calculate the specific sound (ambient – residual = specific).

Where the source (specific sound) is not yet operational, it is permissible to measure the specific sound elsewhere (or to use known manufacturers' or library data) and then model the impact of this against the known background level.

Rating level

Once the specific sound level has been determined, this must be corrected in terms of the need to consider the subjective prominence of the impact of the sound at noise-sensitive receivers, and the extent to which acoustically distinctive characteristics will attract attention.

BS 4142 states that this is normally possible to carry out a subjective assessment of characteristics, based on the following correction guidelines:

- **Tonality:** +2 dB for a 'just perceptible' tone, +4 dB for 'clearly perceptible', and rising to +6 dB for 'highly perceptible' tones
- **Impulsivity (rapidity of change and overall chance in level):** +3 dB for 'just perceptible' impulsivity, +6 dB for 'clearly perceptible', rising to +9 dB for 'highly perceptible' impulsivity
- **Intermittency:** if the on/off-time of the specific sound is readily distinctive at the noise-sensitive receivers, +3 dB
- **Other sound characteristics:** (see page 14 or 20 in PDF file of 4142)

It should be noted that where one feature is clearly perceived as dominant, it may be applicable to correct for that feature only. Where multiple features are likely to affect perception and response, each should be added arithmetically.

Appendix D Haringey EHO E-mail Correspondence

From: Phillip Lu
Sent: 04 May 2021 13:06
To: [Jennifer Barrett](mailto:Jennifer.Barrett@Haringey.gov.uk)
Cc: Shinade Wilson <Shinade.Wilson@BuroHappold.com>; Spencer Mason <Spencer.Mason@BuroHappold.com>
Subject: High Road West - Noise Impact Assessment

Good afternoon [Jennifer](#),

My name is Phil, and I am the acoustic consultant working on the High Road West scheme. Our scope is to prepare a Noise Impact Report for planning submission for the following sites:

- Goods Yard II
- 867-879 High Road II
- 819-829 High Road

I want to go through our assessment methodology and get an agreement in preparation for the submission.

Firstly, a bit of background information. A Noise and Vibration assessment was submitted for planning for the following sites:

- Goods Yard II - HGV/2018/0187
- 867-879 High Road II - HGV/2019/2929

The previous schemes are very similar to our current proposals, which are residential-led mixed-use developments. Both assessments have baseline survey data which I'm hoping to recycle for a couple of reasons:

1. The noise and vibration survey was carried out pre-covid (late 2017 & early 2019), meaning the noise levels are considered to be representative of the pre-covid noise climate
2. Given the similarities with the previous and current scheme, the existing survey locations are considered acceptable to assess the following:
 - a. Potential noise impact upon the proposed development (façade noise levels and acoustic requirements)
 - b. Background sound level to assess the noise impact upon existing noise-sensitive receivers (some NSRs only. Additional measurements required)

Our assessment proposal is as follows:

Baseline noise climate

The previous survey locations are shown in the sitemap below.



Next to the railway line, we have a long-term noise and vibration measurement and short term measurements to capture the road traffic noise from the High Road and White Hart Lane.

- The long term measurement will be used to:
 - Assess rail noise upon the proposed scheme
 - Assess rail groundborne vibration upon the proposed scheme
 - Set plant noise emission limits upon NSRs located to the west.
- The short term measurements will be used to:
 - Assess road traffic noise upon the proposed scheme (High road and White Hart Lane)

We propose an additional three short-term measurement locations during the quietest day and night period to capture the background sound level at the existing NSRs to the north, east and south of the proposed developments. The locations are shown in the figure below. These will be 15-minute snapshots taken in a circuit fashion. We expect to take 3 lots of 15 minute measurements at each location.



Even though these measurements will be carried out during covid times, the background sound level is expected to be slightly lower, meaning the plant noise limits will be more onerous than pre-covid levels. This should provide a robust level of assessment.

Assessment criteria

We propose to use the following assessment criteria, standards and guidelines:

- Acceptable indoor ambient noise levels – BS 8233:2014 Guidance on sound insulation and reduction in buildings 2014 & WHO Guidelines for community noise
- Acceptable ambient noise levels in external amenity areas - BS 8233:2014 & WHO
- Acceptable ground-borne vibration levels (human perception) – BS 6472- Guide to evaluation of human exposure to vibration in buildings
- Plant noise limits – BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound. We propose that the rating level associated with fixed plant items is limited to 5 dB below the typical background level at the identified existing NSRs.

Report content

The contents of our noise impact report will be:

- Description of the proposed development and site;
- Acoustic criteria and planning requirements;
- Existing baseline conditions at the site and surrounding area;
- Potential noise impact upon the proposed development in terms of façade noise-break-in (including commentary on noise during overheating conditions);
- Potential noise impact upon existing NSRs (including activity noise and plant noise emissions);
- Noise mitigation measures such as acoustic façade requirements and limiting noise levels for plant and equipment (where required); and
- Conclusions.

I trust the above is clear. If you have any questions or queries, please feel free to call my mobile.

Many thanks,

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BURO HAPPOLD

RE: High Road West - Noise Impact Assessment



Phillip Lu
To: Jennifer.Barrett@Haringey.gov.uk
Cc: [Shinade Wilson](#); [Spencer Mason](#); [Harrington Graham](#); [Robbie.McNaugher@haringey.gov.uk](#)

Reply

Reply All

Forward

...

Wed 19/05/2021 17:31

Hi Jennifer,

Just following up on the e-mail below.

Any thoughts and comments?

Many thanks,

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