21 Bloomsbury Street

Planning Report for Acoustics

65204879-SWE-ZZ-XX-T-U-0003
Ver.: C02

SWECO

Status / Revisions

Ver:	Date:	Description	Author	Reviewed	Approved by
P01	04/05/2022	Draft for Client Comment	HA	DD	JW
C01	18/07/2022	First Issue	HA	DD	JW
C02	01/08/2022	Minor Amendments	HA	DD	JW

Sweco

Eldon House, 2 Eldon Street, London, EC2M 7LS

+44 (0)20 3002 1210

acoustics@sweco.co.uk

www.sweco.co.uk

Sweco UK Limited are full members of the Association of Noise Consultants (ANC):

Project Name:	21 Bloomsbury Street, London
Project Number:	65204879
Client:	Capital 38 Ltd
Ver:	C02
Date:	01/08/2022
Author:	Hasan Akil
Controlled by	Dan Doherty
Approved by	James Williams
	65204879-SWE-ZZ-XX-T-U-0003
Document Filepath:	P:\6512\65204879_21_Bloomsbury_Street\005\04 Deliverables Management\Reports & Presentations\Planning Report - Plant Only\652004879-SWE-ZZ-XX-T-U-0003 C02 - Planning Report.docx

Table of contents

1. Introduction

1.1 Introduction

Sweco UK Limited have been appointed by Capital 38 Ltd to provide acoustic consultancy services in relation to 'the proposed development' at 21 Bloomsbury Street, London, WC1B 3HF ('the application site'). This report presents preliminary acoustic assessments to accompany the planning application for the proposed development.

This report contains technical terminology relating to acoustics. For this reason, an introduction to acoustics and a glossary of terminology is presented in Appendix 1.

1.2 The Application Site

The application site is located within the London Borough of Camden (LBC) planning authority area and is currently occupied by an existing six-storey office building.

The application site is bounded by Bedford Avenue to the north, Bloomsbury Street to the east and to the partially adjoining buildings to the south (Radisson Blu Edwardian Kenilworth Hotel) and west (residential dwellings on Bedford Avenue. The south-west boundary of the application site overlooks a communal lightwell area. The application site is directly adjacent to the existing hotel (Radisson Blu Edwardian Kenilworth Hotel) at 97 Great Russell Street and existing residential dwellings at 41-73 Bedford Avenue.

1.3 The Proposed Development

The proposed development involves the comprehensive refurbishment of the existing office building and comprises:

- Existing façade will be retained with window replaced on the façade overlooking Bedford Avenue and Bloomsbury Street. The windows at the rear of the site are understood to be retained;
- Office floors to be fitted out to typical Cat A standards;
- New sixth floor will be constructed;
- A new roof terrace to be constructed at seventh floor level providing a new amenity space
- All existing mechanical services plant will be replaced and located at a designated area on the roof or the atmospheric termination grilles shall be located on the roof and at lower ground floor level; and
- A number of new spaces are proposed within the basement such as a small café area (at the bottom of the atrium), gymnasium, changing/shower facilities and cycle store.

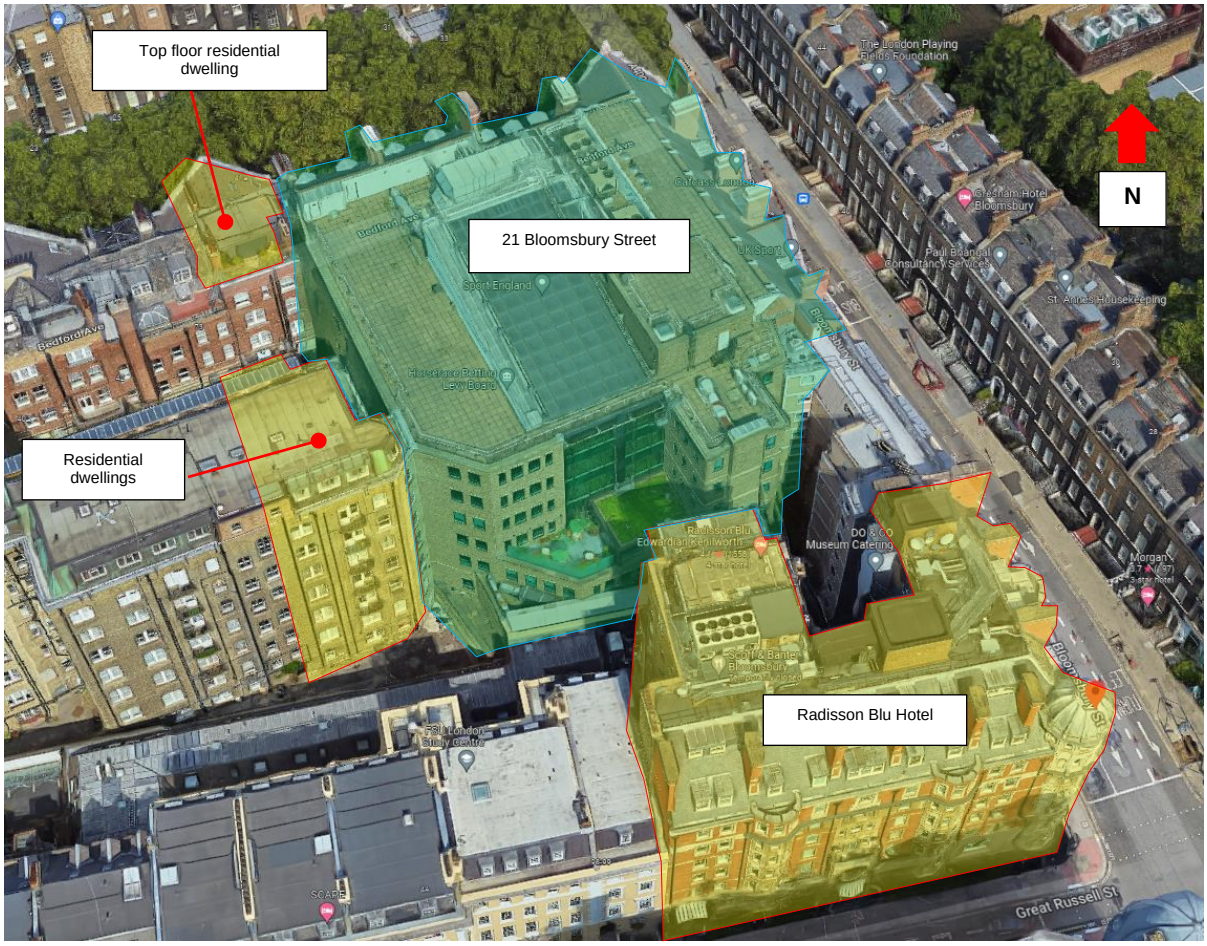
1.4 Nearby Noise-Sensitive Receptors

Multiple sensitive receptors are located within the vicinity of the application site. The key noise-sensitive receptors have been identified as follows:

- Top floor residential dwellings (north west) at 40-73 Bedford Avenue, London WC1B 3AA;
- Top floor residential dwellings (west) at 40-73 Bedford Avenue, London WC1B 3AA; and
- Radisson Blu Edwardian Kenilworth Hotel at 97 Great Russell Street, London WC1B 3LB.

The nearest noise-sensitive receptors to the proposed development are shown in Figure 1-1 below:

Figure 1-1: Noise sensitive locations near the application site



1.5 Scope of This Report

The scope of this report has been developed through a review of national and local planning policy and through a review of previous planning conditions imposed by the London Borough of Camden planning authority for similar commercial developments. This is described further in Section 2.4.

This report aims to support the planning application by providing further detail with respect to the potential effects due to noise arising from the proposed development as follows:

- Details and results of environmental noise surveys carried out in the vicinity of the application site are presented.
- Limits that apply to noise from building services equipment at nearby sensitive receptors are presented within this report. An outline assessment of noise from the primary building services systems is also presented.

Mitigation measures have been considered where the proposed development would otherwise result in adverse effects due to building services noise. The mitigation measures that are expected to be required to control noise from the primary building services systems are indicated with this report. The acoustic design of the building services systems will need to be reviewed as the design progresses to ensure that no adverse effects occur.

2. Planning Policy, Guidance & Standards

2.1 Overview

This section presents national and local policies, standards, guidance and criteria that are relevant to the proposed development and the scope of this report.

2.2 National Planning Policy and Guidance

2.2.1 National Planning Policy Framework and Noise Policy Statement for England

Two national planning policy documents are relevant to the proposed development:

- The 'National Planning Policy Framework (NPPF)'[1];; and
- The 'Noise Policy Statement for England (NPSE)'[2].

The NPPF sets out the Government's planning policies for England and describes how these are applied. The NPSE sets out the long-term vision of the Government's noise policy and the following noise policy aims:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life.

The NPSE relates the above terminology to concepts from toxicology, as applied by the World Health Organization, and defines the following:

- NOEL (No Observed Effect Level): No detectable effect on health and quality of life due to noise.
- LOAEL (Lowest Observed Adverse Effect Level): Threshold above which there are adverse effects on health and quality of life due to noise.
  Noise policy aim: Noise above this threshold to be mitigated and minimised.
- SOAEL (Significant Observed Adverse Effect Level): Threshold above which there are significant adverse effects on health and quality of life due to noise.
  Noise policy aim: Noise above this threshold to be avoided.

The NPSE should be taken into account in the preparation of local and neighbourhood plans and is a material consideration in planning decisions. It applies to all forms of noise (apart from noise in the workplace) and aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context.

2.3 Planning Practice Guidance

In July 2019, the Government published updated national planning practice guidance (NPPG) for Noise[3]. The NPPG includes further guidance on the effect levels described in the Noise Policy Statement of England and examples of the outcomes at each effect level. It also presents further factors that need to be considered when assessing noise and the effect on future occupants of the proposed

[1] *National Planning Policy Framework (NPPF)*, Ministry of Housing, Communities & Local Government, July 2021.
[2] *Noise Policy Statement for England (NPSE),* Department for Environment, Food & Rural Affairs, March 2010.
[3] https://www.gov.uk/guidance/noise--2

development, such as the need to provide alternative ventilation methods when relying on the closed windows to provide suitable indoor acoustic conditions in sensitive rooms.

2.4 Regional Planning Policy

2.4.1 The London Plan 2021

The London Plan 2021 ("*The Spatial Development Strategy for Greater London*, March 2021") has recently been published and is a material consideration in planning decisions.

The London Plan has the policies relevant to this report and relevant extracts from these key policies are presented below:

Policy D3: Optimising site capacity through the design-led approach

"A: All development must make the best use of land by following a design-led approach that optimises the capacity of sites, including site allocations. […] The design-led approach requires consideration of design options to determine the most appropriate form of development that responds to a site's context and capacity for growth, and existing and planned supporting infrastructure capacity (as set out in Policy D1A), and that best delivers the requirements set out in Part B. […]

D: Development proposals should: […]

9) help prevent or mitigate the impacts of noise and poor air quality."

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. […]

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 refuse development proposals that have not clearly demonstrated how noise and other nuisances will be mitigated and managed."

Policy D14: Noise

"A: The transport, spatial and design policies of this plan will be implemented in order to reduce and manage noise to improve health and quality of life and support the objectives of the Mayor's Ambient Noise Strategy. Development proposals should seek to 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 development) 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 the application of 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. […]"*

Policy SI4: Managing heat risk

This policy requires that major development proposals demonstrate how they will reduce the potential for internal overheating and reliance on air conditioning systems. The supporting guidance states that passive ventilation should be prioritised, taking into account external noise and air quality in determining the most appropriate system.

2.5 Local Planning Policy and Guidance: London Borough of Camden

2.5.1 London Borough of Camden Local Plan

The Camden Local Plan (2017) was adopted in January 2017 and is the strategy for planning the London Borough of Camden. Policy A4 deals with noise requirements for new development and states as follows:

Policy A4 Noise and vibration

"The Council will seek to ensure that noise and vibration is controlled and managed.

Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for:

a. development likely to generate unacceptable noise and vibration impacts; or

b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development."

There are further details on Noise and Vibration are addressed between section 6.84 and section 6.106 of the Local Plan, as summarised below:

Sources and the character of noise in Camden

6.86 "The main sources of noise and vibration in Camden are; road traffic, railways, industrial uses, plant and mechanical equipment, food, drink and entertainment uses, and building sites. The top six sources of noise that receive the most complaints in Camden are; music, construction noise, general people noise (e.g. footsteps, gathering), parties, fixed machinery and burglar alarms."

Assessing the impact of noise and vibration

6.89 "Where uses sensitive to noise and vibration are proposed close to an existing source of noise or when development is likely to generate noise is proposed, the Council will require an acoustic report to accompany the application. In assessing applications, we will have regard to noise and vibration thresholds, set out in Appendix 3, and other relevant national and regional policy and guidance and British Standards. Further guidance on the application of these standards will be provided in supplementary planning document Camden Planning Guidance on amenity.

*6.90 Noise sensitive development includes **housing**, **schools** and **hospitals** as well as **offices**, **workshops** and **open spaces**. The impacts on external amenity spaces such as gardens and balconies will also be considered. Our supplementary planning document provides further information on how to minimise the impact of noise of developments; ways to mitigate noise emitted from developments and further detail on how the Council will assess the impact of noise and vibration.*

6.91 Noise generating uses and fixed machinery will likely have a greater impact on amenity when the background noise level is lower or in areas where noise sensitive uses such as residential developments co-exist with other uses. The Council will take into consideration the general character of the noise (whether noise is intermittent, has a distinct screech, bang, hiss) and where appropriate, the cumulative impacts of noise from one or more noise sources and will assess whether tighter noise restrictions, secured by planning condition, should be imposed.

6.92 Planning permission will not normally be granted for development sensitive to noise in locations that have unacceptable levels of noise and vibration. The Council will only grant planning permission for development sensitive to noise and vibration, in locations that experience high levels of noise and for development likely to generate noise impacts, if appropriate attenuation measures can be taken. Such attenuation measures should be included on plans. Planning permission will not be granted in instances where there will be a significant adverse impact on external amenity areas including gardens, balconies and open spaces unless they can be appropriately mitigated.

6.100 Emergency equipment such as generators which are only to be used for short periods of time will be required to meet the noise criteria of no more than 10dB above the background level (L90 15 minutes). During standby periods, emergency equipment will be required to meet the usual criteria for plant and machinery. Conditions to this effect may be imposed in instances where emergency equipment forms part of the application."

2.6 London Borough of Camden Typical Planning Condition for Noise from Building Services

2.6.1 The London Borough of Camden Environmental Health department have been consulted previously in relation to noise from building services systems and fixed mechanical plant. Their typical planning condition in relation to this aspect has previously been provided and is understood to be as follows:

"Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion)."

2.7 Summary of Assessment Approach

The above policies, guidance and standards, and the LBC typical planning policy requirements have been used to inform the assessment approach for each aspect.

The following approach will be adopted for the assessments within this report:

Noise from Building Services

- Undertake an environmental noise survey to include positions representing the nearest noise-sensitive receptors.
- Carry out an analysis of the measured background sound levels to determine the most commonly occurring background sound level, dB $L_{A90,15\ min}$ for relevant time periods.
- Determine limits for noise from building services systems and fixed mechanical plant. These limits shall be set to a level that is 10 dB below the most commonly occurring background sound level and defined at one metre from the window of the nearest noise-sensitive premises. This is in accordance with the LBC planning policy requirements.
- Carry out an assessment of outdoor noise from the proposed building services systems accounting for the initial proposals for primary ventilation and heating/cooling systems.
- Identify the expected noise control measures required to achieve the building services sound 'rating level' limits.

3. Environmental Noise Survey

3.1 Overview

An environmental noise survey was undertaken by Sweco UK in March 2022 in order to quantify the prevailing environmental noise levels on and around the application site. This survey consisted of long-term unattended monitoring at two positions.

Long-term measurements were carried out between the morning of Thursday 10th March 2022 and the morning of Tuesday 15th March 2022, to cover typical weekdays and the weekend.

This section presents details of the survey procedure along with the summary noise measurements results at each position.

3.2 Procedure

The environmental noise survey was undertaken using suitable noise measurement equipment configured to log sound pressure level in each octave frequency band every 15 minutes. The sound level logging data was then analysed to determine the following parameters, described in Appendix 1, for relevant times of day and night:

- dB $L_{Aeq,T}$: Equivalent continuous A-weighted sound pressure level.
- dB $L_{A01,T}$: One-percentile A-weighted sound pressure level.
- dB $L_{A90,T}$: 90th percentile A-weighted sound pressure level (commonly described as the background sound level).

All noise measurements were undertaken by a consultant experienced in environmental noise monitoring and following the principles of BS 7445[4].

The sources of noise that contributed to the noise climate at each position were noted upon installation and collection of the long-term unattended monitoring equipment. The prevailing weather conditions also were observed and supplemented with weather data from local weather stations (Weather Underground).

Long-term environmental noise measurements were taken at the positions listed in Table 3-1 and is shown in Figure A2-1 in Appendix 2.

Table 3-1: Long-term noise measurement positions

Position ref.	Position description	Conditions and height
MP1	A microphone was located on a perimeter barrier at the western roof level application site boundary near the residential dwellings located to the west. Measurements at this position were undertaken in free-field. The measurements at this position were representative of the existing building services plant noise serving the Application Site and surrounding buildings and the background sound environment for the nearest noise sensitive receptors overlooking the application site.	Free-field, circa 23 m above local street level and circa 1.5 m above roof level
MP2	A microphone was located on a ground floor/street level at the eastern application site boundary overlooking Bloomsbury Street. Measurements at this position were undertaken approximately 0.5m from the nearest reflective surface. The measurements at this position were representative of the road traffic noise from Bloomsbury Street and the background sound environment for receptors north and east of the application site.	Facade, circa 1.0 m above street level

[4] British Standard 7445: 2003: *Description and measurement of environmental noise*, 8BSI, 2003

3.3 Equipment

Details of the noise monitoring equipment used during the survey is presented within Appendix 3. All equipment used during the survey conformed to Type 1 specification of British Standard 61672.

The microphones were fitted with protective windshields for the measurements.

Each meter had been calibrated by a UKAS accredited laboratory within the previous 24 months. The calibration level was also checked at the start and end of the survey using field calibrators (which had been suitably calibrated by an accredited laboratory). There was no significant drift in the calibration over the course of the survey (≤0.4 dB).

3.4 Observations and Weather Conditions

The sources of noise that contributed to environmental noise climate were noted during attended periods. The application site is exposed to moderate levels of environmental noise, not untypical for the Central London setting. Environmental noise conditions at the application site were mainly affected by road traffic noise from vehicle movements from Bloomsbury Street roads as well as building services noise from systems serving the surrounding buildings and the application site.

Weather conditions during the monitoring period were generally dry with average wind speeds remaining below 5 m/s and were therefore suitable for environmental noise monitoring. Weather conditions during the long-term measurements have been investigated using Weather Underground (station ILONDO440), and were suitable apart from the following periods:

- Periods of intermittent light rain occurred between 14:19 and 18:04 and between 20:14 and 21:14 on 11/03/2022
- Short period of light rain occurred at 07:24 for around 10 minutes on 12/03/2022
- Short period of light rain occurred at 12:49 for around 10 minutes on 13/03/2022

The above periods have been excluded from the noise data analysis.

3.5 Measurement Results

The measurement data has been analysed to determine the following parameters for each day of the survey:

- The equivalent continuous sound pressure level, dB $L_{Aeq,8\ hour}$, during weekday office hours.
- The one-percentile sound pressure level, dB $L_{A01,1\ hour}$, during weekday office hours.
- The most commonly occurring background sound level, dB $L_{A90,10\ min}$, during weekday office hours and the night-time.

The following section presents a summary of these measured noise levels at each position. Detailed measurement results are presented in Appendix 4.

3.5.1 Summary Results

A summary of the noise measurement results obtained at each long-term unattended monitoring position is presented in Table 3-2.

Table 3-2: Summary of the long-term noise measurement results

Position reference and microphone conditions	Range of equivalent continuous SPL		Range of typical one-percentile SPL*	Range of most commonly occurring background sound levels per period	
	[dB $L_{Aeq,8\ hour}$]	[dB $L_{Aeq,8\ hour}$]	[dB $L_{AF01,1\ hour}$]	[dB $L_{A90,10\ min}$]	
	Office hours [07:00-19:00]	Night-time [23:00-07:00]	Office hours [07:00-19:00]	Office hours [07:00-19:00]	Night-time [23:00-07:00]
MP1 (free-field)	58 to 59	52 to 53	61 to 65	57 to 58	42 to 45
MP2 (facade)	67 to 69	62 to 65	78 to 80	53 to 59	47 to 50
* The one-percentile sound pressure level reported above were the second highest dB $L_{AF01,1\ hour}$ value measured between 09:00-17:00 on each weekday. The stated value represents the one-percentile sound pressure that is not normally exceeded during office hours.					

3.5.2 Ambient Noise Levels at the Application Site

Typical equivalent continuous and one-percentile sound pressure levels during weekday office hours have been determined at each noise measurement position. These outdoor noise levels are presented in Table 3-3.

Table 3-3: Summary of the ambient noise levels measured at each elevation of the proposed development

Elevation	Equivalent continuous SPL [dB $L_{Aeq,12\ hour}$]	Typical one percentile SPL [dB $L_{A01,1hour}$]
	Weekday office hours [07:00-19:00]	Weekday office hours [07:00-19:00]
North east façade, local street level (overlooking Bloomsbury Street) (MP2)	68	78
North west façade, local street level (overlooking Bedford Avenue) (MP2)	68	78

3.5.3 Background Sound Levels at Adjacent Noise-Sensitive Receptors

Measured background sound levels at the nearest noise-sensitive properties to the application site are presented in Table 3-4. These levels will be used to establish limits for noise from building services plant and machinery associated with the proposed development.

Table 3-4: Summary of background noise levels near the application site

Receptor	Representative measurement position	Most commonly occurring background sound level [dB $L_{A90,10\ min}$ in façade conditions]	
		Weekday office hours [07:00-19:00]	Night-time [23:00-07:00]
40-71 Bedford Avenue: Top floor residential dwelling located to the north west of Application Site	MP1	60	45
40-71 Bedford Avenue: Top floor residential dwelling located to the west of Application Site	MP1	60	45
97 Great Russell Street: Radisson Blu Edwardian Kenilworth Hotel	MP1	60	45

Background sound levels are presented as the most commonly occurring values at the nearest representative measurement positions referenced in Table 3-4. This is in accordance with the requirements within the LBC typical planning policy requirements.

4. Limits on Building Services Noise

4.1 Overview

There will be sources of sound of an industrial / commercial nature associated with the operation of the proposed development such as building services systems and fixed mechanical plant.

This section presents limits on building services noise which apply at nearby noise-sensitive receptors. These limits depend upon the measured background sound level, which varies depending on the time of day, as shown in Section 3.5.2. Therefore, different building services sound 'rating level' limits apply at different times of day.

4.2 Limits

According to LBC typical planning policy requirements, the sound 'rating level' emitted from any new building services systems will need to be at least 10 dB below the most commonly occurring background sound level, at one metre from the window of the nearest noise-sensitive premises.

This requirement has informed the building services sound 'rating level' limits which are presented in Table 4-1.

Table 4-1: Limits on building services noise according to LBC typical planning policy requirements

Noise sensitive receptor (and position)	**Building services sound 'rating level' limits at the nearest noise sensitive receptors [dB $L_{Aeq,T}$ in façade conditions]**	
	Systems operating during weekday office hours only [07:00-19:00]	**Systems operating at any time of day**
40-71 Bedford Avenue: Top floor residential dwelling located to the north west of Application Site	50	35
40-71 Bedford Avenue: Top floor residential dwelling located to the west of Application Site	50	35
97 Great Russell Street: Radisson Blu Edwardian Kenilworth Hotel	50	35

These building services sound 'rating level' limits apply to the cumulative level of sound from all building services systems associated with the proposed development that is measured or predicted at a position 1 metre from the nearest window to sensitive uses at each receptor.

5. Outline Building Services Noise Impact Assessment

5.1 Overview

This section presents an outline assessment of noise from the building services systems.

At this stage, initial proposals for the primary plant items have been developed. The key sources of building services noise are envisaged to be the external building services plant for ventilation and heating/cooling. This outline building services noise impact assessment therefore presents the noise control measures that are expected to be required for these primary plant items.

5.2 Methodology

In order to predict the level of building services noise associated with the operation of the proposed development, a three-dimensional acoustic model has been constructed using the Datakustik Cadna/A sound propagation modelling software. The software carries out sound propagation predictions in accordance with ISO 9613-2 [5].

The sound propagation model allows for the building services noise level to be predicted at the assessment location taking into account factors such as geometric spreading and ground absorption over distance, the effect of any intervening buildings, walls or ground features, as well as reflections from the hard surfaces that are part of the proposed development.

Details of the sound source and modelling assumptions incorporated into this outline assessment are presented below.

5.3 Proposed Sound Sources and Assumptions

The sound sources that are considered at this stage are the outdoor heating/cooling plant for the proposed development which is proposed to be located at a high level (level 06) plant area near the north-east elevation. Details of the primary plant systems have been provided by the mechanical engineer and are presented in Table 5-1.

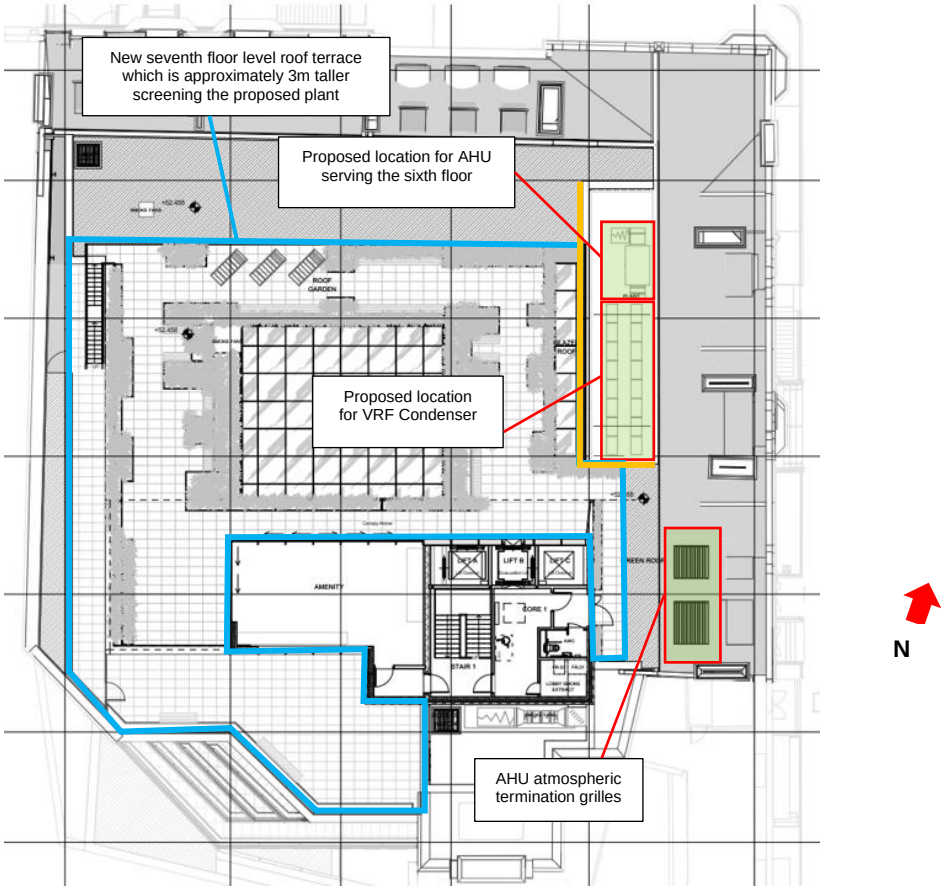
Table 5-1: Source emission levels for the proposed plant

Sound source	Number of items	Source sound emission level		Source of sound level information
		Sound pressure level	Sound power level	
VRF Condensers: Mitsubishi PURY EP 300YLM-A1	16 No.	62.5 dB L_{pA} at 1m	86 dB L_{wA}	Manufacturer (Mitsubishi Electric) published datasheets
AHU: Flakts eQ Prime Top-023	7* No.	-	Fresh Air Intake - 70 dB L_{wA} Exhaust - 86 dB L_{wA} Casing - 69 dB L_{wA}	Manufacturer (Flakts) published datasheets
* six of these units will be located on each floor of the building (one per floor) and only one AHU will be located on the roof. The remaining units will share a common duct which has atmospheric termination grilles at roof level				

[5] ISO 9613 Part 2: *Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation*, International Organization for Standardization, 1996.

The location of the proposed sound sources have been accounted for with reference to drawings provided by the mechanical engineer. Please see Figure 5-1 below.

Figure 5-1 : Proposed amended roof layout



Current design proposals allow for AHU atmospheric ducts (fresh air intake and exhaust to have suitably sized attenuators fitted). The proposed plant located at sixth floor level will be effectively screened from the nearest noise sensitive receivers due to the new sixth floor construction and a new solid barrier erected at the perimeter of the roof terrace.

The location and dimensions of proposed and existing buildings have been modelled using drawings provided by the Client.

The ground profile has been based on topographic data, from the Environment Agency's open source LIDAR data. The intervening ground between the proposed development and the nearest receptors is assumed to be hard ground (reflective to sound).

The sound level predictions allow for second order reflections of sound from surrounding buildings which are assumed to be highly reflective to sound (e.g. masonry, steel or glass).

Predicted specific sound levels are expressed in terms of the equivalent continuous sound pressure level over extended office hours, $L_{Aeq,12\ hours\ (07:00\text{-}19:00)}$. At the time of writing, hours of plant operation are confirmed to be between 07:00 and 19:00, which is in line with the mechanical ventilation strategy and the above primary plant systems for the office floors will not be required to operate outside of these hours.

5.4 Building Services Noise Predictions & Assessment

The level of noise due to the proposed building services systems has been predicted at the nearest sensitive receptors. The predicted building services noise levels at the worst-affected position at each receptor are presented within this section and within Figure A5-1 in Appendix 5.

Predicted building services noise levels are shown in Table 5-2.

Table 5-2: Predicted building services noise levels at the nearest receptors

Receptor	Time of the day	Sound 'rating level' limit at receptor [dB, $L_{Ar,Tr}$]	Predicted building services noise level at worst-affected position on receptor [dB, $L_{Ar,Tr}$]	Difference [dB] and conclusion
Top Floor Residential Dwelling (north west)	Weekday office hours	50	48	-2 (limit achieved)
Top Floor Residential Dwelling (west)	Weekday office hours	50	44	-6 (limit achieved)
Radisson Blu Hotel (south)	Weekday office hours	50	46	-4 (limit achieved)

Predicted building services noise levels at the receptors located further from the application site are lower than those shown within Table 5-2. Therefore, Table 5-2 demonstrates that, with the new office floor and AHUs fitted with attenuators, the building services sound 'rating level' limits presented in Section 4 will be achieved at all receptors.

Where the building services sound 'rating level' limits are achieved, noise from the building services systems that operate during office hours only will result in a low impact and requirements of the LBC typical planning policy requirements are likely to be achieved.

Details of the expected noise control requirements are presented in Section 5.5.

5.5 Expected Noise Control Requirements

The following noise control requirements will need to be introduced into the detailed design of proposed development to achieve the building services sound 'rating level' limits in Section 4:

- The proposed plant located at sixth floor level is below the new sixth floor construction
- AHUs fresh air intake and exhaust ducts are fitted with suitably sized attenuators;
- The outdoor VRF condensing units shall be selected with an individual sound power level that accounts for the number of units and the location of units. At this stage, assuming sixteen units within the plant area, the sound power level of each unit shall not exceed 86 dB L_{wA}. and
- The use of the outdoor condensing units is to be limited to office hours only (see Section 5.6).

Further assessment of buildings services noise will need to be carried out as the detailed design progresses. This will ensure that the building services noise level limits in Section 4 are achieved.

5.6 Out of Office Hours Operation

It is noted that the above assessment applies to the operation of the primary roof plant during office hours. Where building services systems are to be used outside of these hours, additional attenuation

will need to be incorporated into the design of the proposed development. This would include a lower sound power limit for the VRF condenser units than that presented above.

Hours of use and the resulting noise control measures will need to be considered carefully during the detailed design stage to ensure that all building services sound ‘rating level’ limits are achieved.

5.7 Conclusions

All sound ‘rating level’ limits required by LBC are expected to be achieved subject to the provision of suitable noise control measures as part of the detailed design of the proposed development. This will require further consideration of building services noise as the detailed design progresses. The potential for any adverse effects due to noise from the building services systems associated within the proposed development will then be minimised.

6. Summary

Sweco UK Limited have been appointed by Capital 38 Ltd to provide acoustic consultancy services in relation to 21 Bloomsbury Street ('the proposed development') located at 21 Bloomsbury Street, London, WC1B 3HF ('the application site'). This report has presented acoustic assessments to accompany the planning application for the proposed development.

The proposed development comprises a complete renovation of the building which will be primarily for office use.

As part of this work, environmental noise monitoring was carried out at the application site and in the vicinity of adjacent noise-sensitive properties. This report presents the survey methodology, a description of the observed noise sources and weather conditions, and the results of the survey.

The observed sources of noise during the daytime were existing building services plant from Application Site and surrounding buildings and road traffic movements on Bloomsbury Street and pedestrian activity. The prevailing weather conditions were generally considered acceptable throughout the survey period and are deemed suitable for the measurement of environmental noise. The identified periods of light rain have been excluded from the noise data analysis.

Sound 'rating level' limits on building services noise have been presented accounting for the results of the environmental noise survey and the typical requirements of the London Borough of Camden. An outline building services noise impact assessment has then been carried out accounting for the proposed primary building services systems (heating/cooling plant and mechanical ventilation plant). The building services sound 'rating level' limits are expected to be achieved subject to the noise control measures identified within this report, such as attenuators fitted to the AHUs, being incorporated into the design. Where this is the case, no significant effects are expected due to building services noise.

The acoustic design of the building services systems will need to be reviewed as the design progresses to ensure these limits are achieved.

The assessments presented in this report therefore demonstrate that there is no reason that the development proposals should be refused on noise grounds.

Appendix 1 Glossary

Sound is the **vibration** of particles in a medium, such as air, which may be detected by the human ear. This sound is defined as noise when it is audible and unwanted or undesirable to a listener.

The vibration, or oscillation, of particles about an equilibrium position results in local pressure fluctuations from the normal pressure. These local pressure fluctuations are described as **sound pressure**, and the number of oscillations per second is described as the **frequency**.

The human ear responds to an incredibly large range of sound pressure, from 0.00002 Pa to 200 Pa, and the **perceived loudness** is proportional to the logarithm of the sound pressure squared. For this reason, sound is measured in terms of a logarithmic parameter, the **sound pressure level**, to approximate the response of the ear. Sound pressure levels are quantified in **decibels (dB)** relative to the threshold of hearing.

The human ear responds to a wide range of sound frequencies, from the lowest perceptible bass note, around 20 Hz, to the highest perceptible treble note, around 20,000 Hz. The ear does not respond equally to each frequency and is most sensitive to sound within the mid-frequency range of around 600 to 8000 Hz.

The response of the ear to each frequency also varies with the sound pressure level. For very loud sounds the difference in perceived loudness between each frequency is less pronounced than for low level sound.

Acousticians measure **sound pressure levels** using sound level meters, which incorporate a **microphone**.

A sound level meter approximates the response of the human ear to sound by using frequency filters. For typical environment sounds, the **A-weighting filter** is used to approximate the response of the ear at typical sound pressure levels. The sound pressure level, adjusted to approximate the response of the ear, is quantified in **A-weighted decibels, dB(A) or dB L_{pA}**.

In a typical environment, the A-weighted sound pressure level will vary with time. For this reason, acousticians use statistical measurement parameters to describe the sound environment. The most common measurement parameters are as follows:

- dB $L_{Aeq,T}$: **Equivalent continuous A-weighted sound pressure level.** This is the energy-average sound pressure level during a measurement period, T.
- dB $L_{AFmax,T}$: **Maximum A-weighted sound pressure level.**
  This is the maximum sound pressure level during a measurement period, T, and measured in a way that approximates the time-response of the ear.
- dB $L_{A90,T}$: **90th percentile A-weighted sound pressure level.**
  This is the sound pressure level exceeded for 90% of the measurement period, T, commonly referred to as the **background sound level**.

The sound pressure level in typical environments are presented in Table A1-1. Further definitions of acoustic parameters are presented in Table A1-2.

Table A1-1: Sound pressure levels within typical environments

Sound Pressure Level, dB	Typical Environment or Description
0	Threshold of hearing
15 to 25	A recording studio
25 to 35	A hotel bedroom at night
35 to 45	An unoccupied office
45 to 55	Quiet residential street
55 to 65	Normal conversation, 1 m away TV programme, listener position
65 to 75	Raised voices, 1 m away Urban high street traffic
75 to 85	Busy motorway traffic, on hard shoulder Typical small plant room
85 to 95	High-speed hand-dryer, operator position Inside London underground (average)
95 to 105	Pneumatic hammer, operator position Concert orchestra
105 to 115	Typical nightclub Untreated generator plantroom
115 to 140	Aircraft take-off, close proximity Threshold of pain

Table A1-2: Definitions of Acoustic Terminology and Parameters

Terminology or Parameter	Definition
Ambient sound level	The total sound pressure level in a given position from all surrounding sources of noise, both near and far. Normally expressed as an equivalent continuous A-weighted sound pressure level, dB $L_{Aeq,T}$.
A-weighting	The process of weighting the observed sound pressure level at each frequency band, to approximate the sensitivity of the human ear to sounds of different frequencies. A-weighted sound pressure levels are expressed as dB(A) or dB L_{Ap}.
Decibel	A logarithmic value quantifying the sound pressure at a specified position or sound power. relative to a reference sound pressure or sound power (20 µPa for sound pressure, 10^{-12} W for sound power).
Façade	A sound monitoring position is a “façade” position when it includes a strong reflection from an adjacent building or structure. This corresponds with a position that is between 1 and 2 metres away from a reflecting building or structure.
Free-field	A sound monitoring position is a “free-field” position when it is not affected by sound reflections from surrounding buildings and structures. This corresponds with a position at least 3.5 metres away from reflecting buildings or structures.
Frequency	The number of oscillations per second of a vibrating particle in a medium, measured in Hertz (Hz) or cycles per second.
$L_{A01,T}$	The A-weighted sound pressure level exceeded during 1% of the time interval, T. Typically used to quantify the sound level of regularly occurring loud events during time interval, T.

Terminology or Parameter	Definition
$L_{A10,18hr}$	The A-weighted sound pressure level exceeded during 10% of the 18-hour time interval between 06:00 and 24:00. This is the UK Road Traffic Noise Index, as defined in the Calculation of Road Traffic Noise (CRTN, HMSO, 1988).
$L_{A90,T}$	The A-weighted sound pressure level exceeded during 90% of the time interval, T. Typically used to quantify the background sound level at a specified position.
$L_{Aeq,T}$	The equivalent continuous A-weighted sound pressure level over a time interval, T. This is an energy-average sound pressure level over the specified time period.
$L_{AFmax,T}$	The maximum A-weight sound pressure level during a specified time interval, T. Measured with “fast” time-weighting (which approximates the time-response of the human ear).
Noise	Unwanted or undesirable sounds observed by a listener.
Octave band	A frequency band used in acoustical measurements. An octave is a frequency interval between two sounds where the frequency of the lower sound is half the frequency of the upper sound. The human hearing range is divided into ten logarithmically equal frequency divisions called octave bands, with centre-band frequencies as follows: (16 Hz, 32 Hz,) 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 16000 Hz.
Residual sound level	The equivalent continuous A-weighted sound pressure level of the ambient sound remaining at a specified position when the specific sound source (the sound source being assessed) does not contribute to the ambient sound.
Sound	The vibration, or oscillation, of particles in a medium, such as air, which may be detected by the human ear.
Sound power level	A logarithmic measurement that quantifies the total sound power of a source emitted in all directions relative to a reference sound power (W_{ref} = 1 pW or 10^{-12} W). Equal to 10 $\log_{10}$ (W / W_{ref}) and expressed in decibels.
Sound pressure level (SPL)	A logarithmic measurement that quantifies the sound pressure at a specified position relative to a reference sound pressure (p_{ref} = 20 µPa). Equal to 20 $\log_{10}$ (p / p_{ref}) and expressed in decibels.
Specific sound level	The equivalent continuous A-weighted sound pressure level at a specified position due to the specific sound source (the sound source being assessed).
Third-octave band	A higher-resolution frequency band used in acoustical measurements. A third-octave band is equal to one of three logarithmically equal parts of the corresponding octave frequency band. The upper band edge frequency is equal to the lower band-edge frequency multiplied by $2^{1/3}$.

Appendix 2 Additional Figures

Figure A2-1: Noise measurement positions

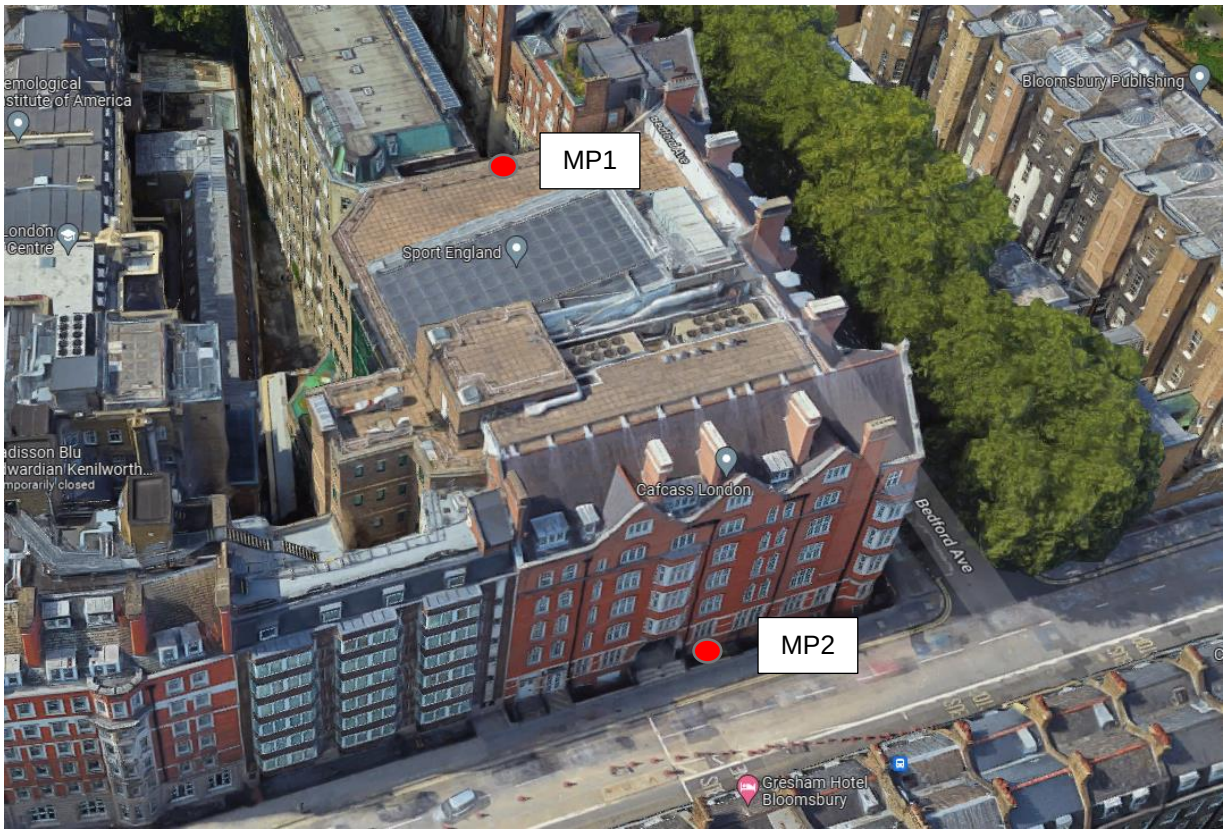


Figure A2-2: Photo of measurement position MP1 (western boundary)

Figure A2-3: Photo of position MP2 (eastern boundary)

Appendix 3 Measurement Instrumentation

Table A3-1: Noise measurement instrumentation

Position	Equipment details				Calibration details	
	Description	Manufacturer	Type Number	Serial Number	Date of calibration	Certificate reference*
MP1	Sound Level Meter	Rion	NL-52	00620957	01/02/23	TCRT21/1082
	Preamplifier	Rion	NH-25	20998		
	Microphone	Rion	UC-59	03875		
MP2	Sound Level Meter	Rion	NL-52	01054199	29/10/23	TCRT21/1756
	Preamplifier	Rion	NH-25	54272		
	Microphone	Rion	UC-59	08655		
All	Calibrator	Rion	NC-74	34212940	04/05/22	TCRT21/1302
**Calibration records are available upon request.*						

Appendix 4 Detailed Noise Survey Results

Figure A4-1: Long-term noise measurement results at position MP1

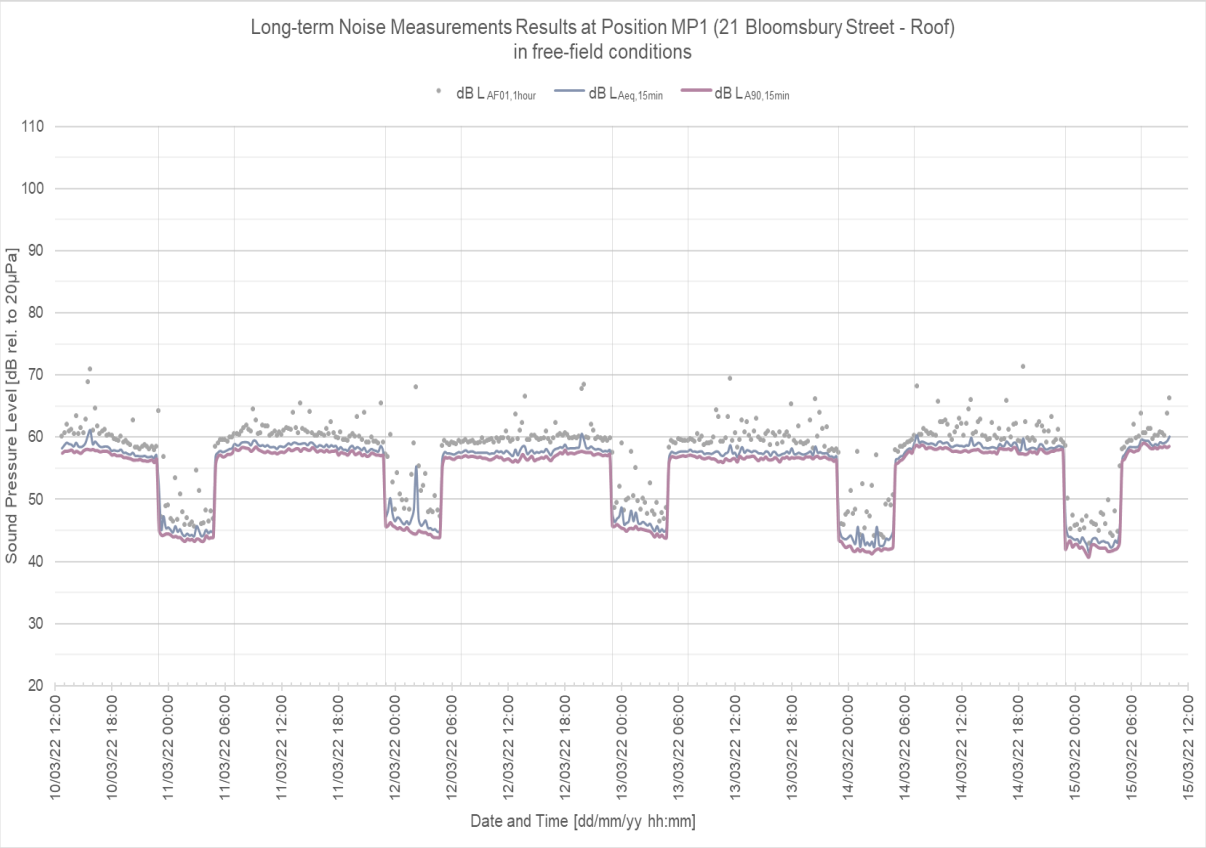


Figure A4-2: Long-term noise measurement results at position MP2

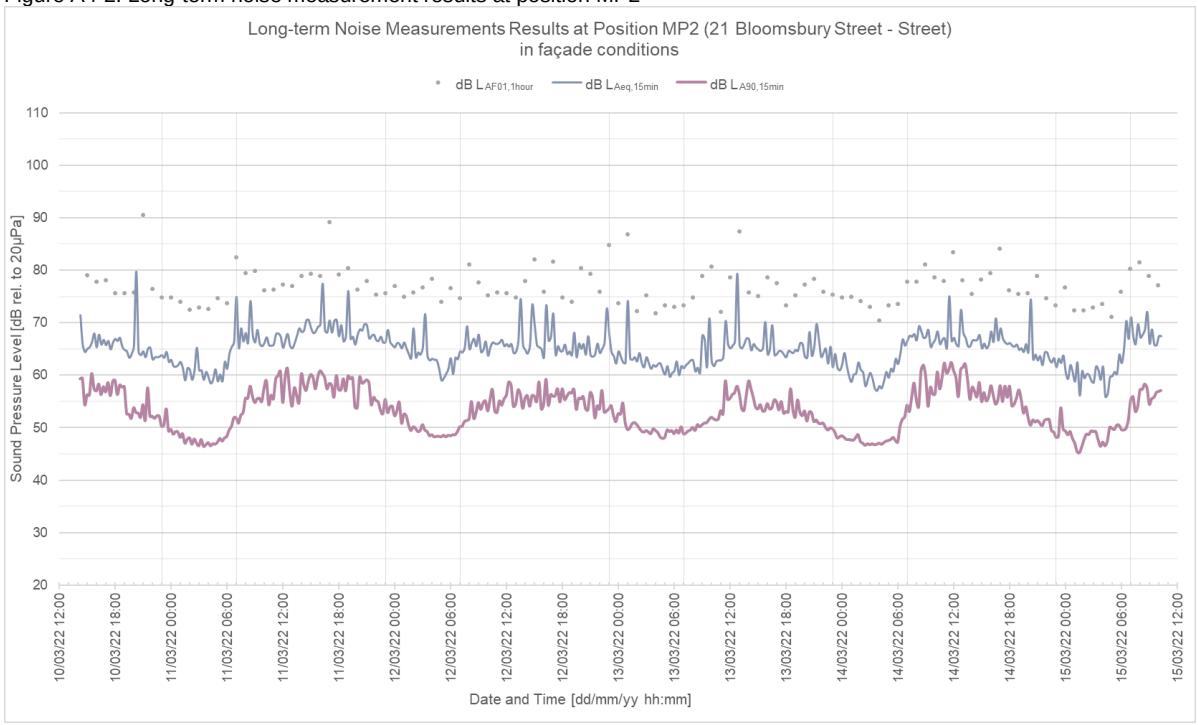


Table A4-1: Summary of noise measurement results at position MP1

Date	Long-term equivalent continuous SPL		Typical one-percentile SPL*	Most commonly occurring background sound level	
	[dB $L_{Aeq,8\ hour}$]	[dB $L_{Aeq,8\ hour}$]	[dB $L_{AF01,1\ hour}$]	[dB $L_{A90,15\ min}$]	
	Office hours [07:00-19:00]	Night-time [23:00-07:00]	Office hours [07:00-19:00]	Office hours [07:00-19:00]	Night-time [23:00-07:00]
Thursday 10/03/2022	-	53	64	58	44
Friday 11/03/2022	59	53	62	58	45
Saturday 12/03/2022	58	52	61	57	45
Sunday 13/03/2022	58	52	63	57	42
Monday 14/03/2022	59	53	65	58	42
Tuesday 15/03/2022	-	-	64	58	-
Weekday Representative Value	**59**	**53**	**65**	**58**	**42**
Weekend Representative Value	**58**	**52**	**-**	**57**	**42**
* The one-percentile sound pressure level were the second highest dB $L_{AF01,\ 1\ hour}$ value measured between 09:00-17:00 on each weekday					

Table A4-2: Summary of noise measurement results at position MP2

Date	Long-term equivalent continuous SPL		Typical one-percentile SPL*	Most commonly occurring background sound level	
	[dB $L_{Aeq,8\ hour}$]	[dB $L_{Aeq,8\ hour}$]	[dB $L_{AF01,1\ hour}$]	[dB $L_{A90,15\ min}$]	
	Office hours [07:00-19:00]	Night-time [23:00-07:00]	Office hours [07:00-19:00]	Office hours [07:00-19:00]	Night-time [23:00-07:00]
Thursday 10/03/2022	-	62	78	59	47
Friday 11/03/2022	69	65	79	56	49
Saturday 12/03/2022	67	64	78	56	50
Sunday 13/03/2022	67	62	79	53	48
Monday 14/03/2022	68	62	79	56	49
Tuesday 15/03/2022	-	-	80	57	-
Weekday Representative Value	**68**	**63**	**78**	**56**	**47**
Weekend Representative Value	**68**	**63**	**-**	**54**	**48**
* The one-percentile sound pressure level were the second highest dB $L_{AF01,\ 1\ hour}$ value measured between 09:00-17:00 on each weekday					

Appendix 5 Detailed Noise Modelling Results

Figure A5-1: Screenshot of noise model and worst-case building services noise level predictions