



---

# The London Tunnels

## 28. Noise and Vibration Impact Assessment

PROJECT NO. 70106185  
REF NO. TLT-WSP-XX-XX-RP-AC-00001

30 November 2023





The London Tunnels PLC

---

## THE LONDON TUNNELS

Noise and Vibration Impact Assessment

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 70106185

OUR REF. NO. TLT-WSP-XX-XX-RP-AC-00001

DATE: NOVEMBER 2023

WSP

WSP House  
70 Chancery Lane  
London  
WC2A 1AF

Phone: +44 20 7314 5000

WSP.com



# QUALITY CONTROL

---

Issue/revision	First Issue
Remarks	
Date	30 November 2023
Prepared by	Maksims Jelovenko
Signature	
Checked by	Momo Hoshijima
Signature	
Authorised by	John Parker / Dimitri Avakian
Signature	
Project number	70106185
Report number	TLT-WSP-XX-XX-RP-AC-00001
File reference	TLT-WSP-XX-XX-RP-AC-00001

## LIMITATIONS OF THIS REPORT

This report has been prepared for the titled project or named part thereof and should not be used in whole or in part and relied upon for any other project without the written authorisation of WSP UK Limited. WSP UK Limited accepts no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/ or WSP UK Limited and agree to indemnify WSP UK Limited for any and all loss or damage resulting therefrom. WSP UK Limited accepts no responsibility or liability for this document to any other part other than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of The Site works and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and our experience. If additional information becomes available which may affect our comments, conclusions or recommendations WSP UK Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.



# CONTENTS

1	INTRODUCTION	1
2	SITE DESCRIPTION	1
2.1	PROPOSED SITE	1
2.2	AMBIENT NOISE CLIMATE	1
2.3	NEAREST NOISE SENSITIVE RECEPTORS	2
	38-41 FURNIVAL STREET	2
	FULWOOD PLACE	2
3	PLANNING POLICY AND GUIDANCE	3
3.1	INTRODUCTION	3
3.2	LOCAL AUTHORITY PLANNING POLICY - CITY OF LONDON	3
	CITY OF LONDON NOISE STRATEGY 2016 TO 2026	3
	CITY OF LONDON LOCAL PLAN (2015)	3
	CONSULTATION	4
3.3	LOCAL AUTHORITY PLANNING POLICY – LONDON BOROUGH OF CAMDEN	4
	THE CAMDEN LOCAL PLAN (2017)	4
	CONSULTATION	4
	CAMDEN PLANNING GUIDANCE AMENITY (2021)	4
3.4	BS 4142:2014+A1 2019	5
4	ENVIRONMENTAL NOISE SURVEY	6
4.1	38-41 FURNIVAL STREET	6
4.2	FULWOOD PLACE	8
5	ENVIRONMENTAL NOISE EMISSION	10

<b>5.1</b>	<b>BUILDING SERVICES PLANT</b>	<b>10</b>
	38-41 FURNIVAL STREET	10
	FULWOOD PLACE	10
	NOISE MITIGATION	11
<b>5.2</b>	<b>OPERATIONAL NOISE EMISSIONS FROM UNDERGROUND TUNNELS</b>	<b>11</b>
<b>6</b>	<b>CONSTRUCTION NOISE AND VIBRATION ASSESSMENT</b>	<b>12</b>
<b>6.1</b>	<b>PLANNING POLICY AND GUIDANCE</b>	<b>12</b>
	CITY OF LONDON	12
	LONDON BOROUGH OF CAMDEN	12
<b>6.2</b>	<b>FULWOOD PLACE</b>	<b>12</b>
<b>6.3</b>	<b>FURNIVAL STREET</b>	<b>12</b>
<b>6.4</b>	<b>TUNNEL NETWORK</b>	<b>12</b>
<b>7</b>	<b>CONCLUSION</b>	<b>14</b>

## TABLES

Table 3-1 - Appendix 3, Table C of Camden's Local Plan: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)	4
Table 3-2 - Camden Council Amenity CPG Checklist	5
Table 4-1 - Noise measurement equipment used for the survey at 38-41 Furnival Street	7
Table 4-2 – Unattended long-term noise survey results at 38-41 Furnival Street (free-field)	8
Table 4-3 – Long-term and short-term measurement comparison at 38-41 Furnival Street (free-field)	8
Table 4-4 - Noise measurement equipment used for the survey at Fulwood Place	9
Table 4-5 – Unattended long-term noise survey results at Fulwood Place (free-field)	9
Table 5-1 - Building services noise emission limits at 38-41 Furnival Street (façade)	10
Table 5-2 - Building services noise emission limits at Fulwood Place (façade)	10
Table 6-1 - Building services noise emission limits at 38-41 Furnival Street	13

---

## **FIGURES**

Figure 2-1 – 38-41 Furnival Street and nearest noise sensitive receptors	2
Figure 2-2 - Fulwood Place and nearest noise sensitive receptors	2
Figure 4-1 - Noise measurement locations at 38-41 Furnival Street	6
Figure 4-2 - Long-term equipment set-up at 38-41 Furnival Street	6
Figure 4-3 - Short-term equipment set-up at 38-41 Furnival Street	7
Figure 4-4 - Weather conditions during long-term noise survey at 38-41 Furnival Street	7
Figure 4-5 - Noise measurement locations at Fulwood Place	8
Figure 4-6 - Long-term equipment set-up at Fulwood Place	9
Figure 4-7 - Whether conditions during long-term noise survey at Fulwood Place	9

---

## **APPENDICES**

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

APPENDIX B

NATIONAL PLANNING GUIDANCE

APPENDIX C

SURVEY DATA

## 1 INTRODUCTION

WSP has been commissioned by The London Tunnels PLC to produce a suite of Application Reports to support the planning application for the proposed The London Tunnels (TLT) project, situated in underground Tunnels that extend between two above-ground sites. These sites are located at 38-39 and 40-41 Fumival Street (further referred to as 38-41 Fumival Street), EC4A 1JQ, and 31-33 High Holborn WC1V 6AX (further referred to as Fulwood Place) in central London, collectively referred to as 'The Site'.

The purpose of this report is to:

- present the methodology and results of an environmental noise survey undertaken to establish the existing baseline noise climate in the surrounding area;
- determine noise emission criteria for fixed building services plant associated with the development;
- provide outline noise and vibration assessment relating to construction and demolition.

As the proposed site extends over two London boroughs, City of London (CoL) and the London Borough of Camden Council (LBC), each subject to its own set of noise policies and regulations, this report is structured to present information that is often segmented between these two distinct sites.

A glossary of technical terms used in this report is given in Appendix A.

## 2 SITE DESCRIPTION

### 2.1 PROPOSED SITE

The Site can be categorised into two distinct areas: above ground and below ground. Above ground, there are two separate locations, Fulwood Place and 38-41 Fumival Street, situated in different boroughs, Camden and the City of London, respectively. Below ground, the site consists primarily of an intricate network of underground Tunnels positioned beneath High Holborn.

The existing underground Tunnels are designated to host a variety of experience venues. The specific themes and purposes of these spaces are currently in the process of being finalised. At this stage of this planning submission, detailed assessments are underway to determine the necessary plant equipment and their respective capacities needed to support the entirety of the project.

Both Fulwood Place and 38-41 Fumival Street will function as key entrances to the Tunnels site. Additionally, 38-41 Fumival Street will house the primary reception area for the TLT project, an office space, basement plant rooms, an air handling unit (AHU) plant room, and a rooftop plant room that serves the entire Scheme.

All the plant equipment responsible for serving the underground Tunnels will be either located within the above-ground sites or connected through a system of ductwork to one of these sites.

### 2.2 AMBIENT NOISE CLIMATE

Both 38-41 Fumival Street and Fulwood Place are situated in the heart of Central London, which places them in immediate proximity to both major and minor roadways. Furthermore, these sites are characterised by a high density of buildings. Consequently, at both above-ground locations, the primary sources of noise predominantly consist of road traffic and the noise generated by nearby establishments, particularly the plant noise.

Additionally, both sites occasionally encounter noise from emergency sirens and aircraft. Moreover, during peak hours, pedestrian noise becomes a notable factor. In the evening, Fulwood Place is further subjected to crowd noise associated with nearby pubs.



## 2.3 NEAREST NOISE SENSITIVE RECEPTORS

### 38-41 FURNIVAL STREET

The use type of the surrounding buildings is shown in Figure 2-1. The residential building at 1-6 Dyer's Buildings is positioned to the east, in an immediate proximity to 38-41 Furnival Street. Furthermore, to the south of the site, 36-37 Furnival Street is comprised of residential flats.

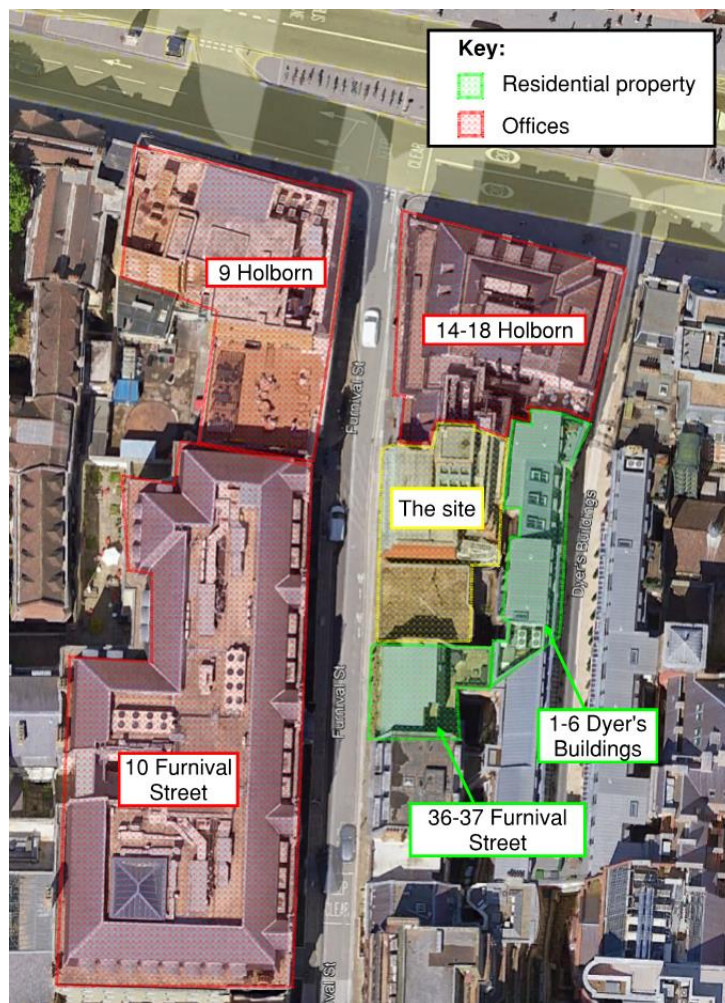
To the west, 10 Furnival Street is an office building that stands as the nearest structure to the site. To the north, 9 and 14-18 Holborn are office buildings that are situated directly adjacent to the site.

By controlling noise emissions potentially affecting these addresses, all other nearby properties will also be protected.

In summary, the four, key noise sensitive receptors (NSRs) most exposed to the site are:

- 1-6 Dyer's Buildings (residential)
- 10 Furnival Street (commercial)
- 36-37 Furnival Street (residential)
- 14-18 Holborn (commercial)
- 9 Holborn (commercial)

**Figure 2-1 – 38-41 Furnival Street and nearest noise sensitive receptors**



### FULWOOD PLACE

The use type of the surrounding buildings is shown in Figure 2-2. The site is surrounded by commercial office and residential buildings with some retail uses. Key noise sensitive receptors (NSRs) most exposed to the site are:

- Floors above 31-33 High Holborn (residential)
- 34-36 High Holborn (residential)
- Fairfax House (commercial),
- 11 South Square (commercial),
- 29-30 High Holborn (commercial),
- 4-7 Fulwood Place (commercial).

By controlling noise emissions potentially affecting these addresses, all other nearby properties will also be protected.

**Figure 2-2 - Fulwood Place and nearest noise sensitive receptors**





### 3 PLANNING POLICY AND GUIDANCE

#### 3.1 INTRODUCTION

This section provides details and a summary of all noise assessment criteria relevant to the Proposed Development.

The noise assessment of the development detailed within this report is based on the following local authority planning requirements and guidance documents:

- The London Borough of Camden Council's planning requirements;
- The City of London's planning requirements; and
- BS4142:2014+A1(2019) 'Methods for rating and assessing industrial and commercial sound'

Details of these documents which are relevant to noise are provided in the following sections.

The noise assessment for the Proposed Development also considers and follows the guidance provided in the following wider national guidance documents:

- Noise Policy Statement for England
- National Planning Policy Framework
- London Plan

The relevant details of these documents are included in Appendix B to this report.

#### 3.2 LOCAL AUTHORITY PLANNING POLICY - CITY OF LONDON

##### CITY OF LONDON NOISE STRATEGY 2016 TO 2026

City of London Noise Strategy 2016 to 2026 aims to bring together and updates policies and programmes that are already in place to manage and mitigate noise in City of London.

The document includes the following statement regarding noise from building services plant and equipment:

*"In order to prevent nuisance and loss of amenity, to protect the acoustic environment and to minimise the upwards creep of ambient noise levels, developers will be required to demonstrate that there will be no increase in pre-existing background noise levels resulting from new plant, equipment or machinery."*

The City Corporation has also set out the following new policy developments:

*POLICY DEVELOPMENTS 1: The City Corporation will seek to manage noise impacts as a result of new development through the introduction and application of appropriate and effective planning procedures, policies, conditions and agreements, and in particular:*

*[...]*

*b) Prevent nuisance, loss of amenity and minimise creeping ambient and background noise levels from developments. Developers will continue to be required to demonstrate that noise levels from new plant, equipment or machinery do not increase background noise levels. Developers will be encouraged to achieve the lowest possible noise emissions.*

*c) Continue to limit and contain noise and vibration from construction and deconstruction activities through the Planning Consent process, based on the latest edition of the City of London Code of*

*Practice for Deconstruction and Construction Sites and other relevant standards. This includes requiring, through planning conditions, the approval and implementation of Environmental Management and Construction Logistics Plans where appropriate.*

*[...]*

*POLICY DEVELOPMENTS 2: The City Corporation will seek to manage noise emissions and impacts of new leisure and entertainment premises through the development, application and enforcement of appropriate, consistent and effective policies, procedures and conditions within the framework of the City of London Statement of Licensing Policy, and in particular:*

*a) Resist the introduction of leisure or entertainment premises into areas where there is a strong likelihood that noise will result in public and/or statutory nuisance or a significant adverse impact. Where the development forms part of agreed wider or longer term planning objectives for the area, seek to mitigate and minimise noise impacts by promoting the City of London Statement of Licensing Policy to ensure noise from licensable activities is adequately managed e.g. use of sound insulation, good acoustic design, operational management measures and limits on hours of operation.*

##### CITY OF LONDON LOCAL PLAN (2015)

Policy DM 15.7 relates to noise pollution in the City of London and states that:

- 1) *"Developers will be required to consider the impact of their developments on the noise environment and where appropriate provide a noise assessment. The layout, orientation, design and use of buildings should ensure that operational noise does not adversely affect neighbours, particularly noise-sensitive land uses such as housing, hospitals, schools and quiet open spaces.*
- 2) *Any potential noise conflict between existing activities and new development should be minimised. Where the avoidance of noise conflicts is impractical, mitigation measures such as noise attenuation and restrictions on operating hours will be implemented through appropriate planning conditions.*
- 3) *Noise and vibration from deconstruction and construction activities must be minimised and mitigation measures put in place to limit noise disturbance in the vicinity of the development.*
- 4) *Developers will be required to demonstrate that there will be no increase in background noise levels associated with new plant and equipment.*
- 5) *Internal and external lighting should be designed to reduce energy consumption, avoid spillage of light beyond where it is needed and protect the amenity of light-sensitive uses such as housing, hospitals and areas of importance for nature conservation."*

Specifically, relating to emissions from building services plant items, the policy states that:

*'Although the City is busy and densely built up, there nevertheless needs to be protection from excessive noise for the general business environment, quiet areas, such as open spaces, and noise-sensitive uses, such as hospitals and housing, and the City's ambient noise levels should not increase. For example, heating and ventilation plant should be designed so that it does not adversely affect nearby open spaces which are valued for their quiet environment. The level of noise emitted from any new plant should be below the background level by at least 10dBA.'*

## CONSULTATION

Following consultation with the environmental health officer (EHO) at CoL, the following feedback was provided on the 2<sup>nd</sup> of September 2023 via email regarding noise from construction works:

*“...the noise survey needs to take into account both when any construction works are in progress and whatever the long-term noise implications may be, i.e. whatever activity and plant will be used.”*

In order to be in line with the above requirement, construction noise assessment at 38-41 Furnival Street site is further discussed in Section 6 of this report.

Additionally, the following clarification regarding specific noise policy was included:

*“Any plant in the City, including emergency plant, should achieve the same standard of 10dB below background to accord with local policy.”*

It has also been agreed with the local authority that the performance standard for fixed plant will be set, using BS 4142:2014+A1:2019 methodology, to achieve a rating level of 10 dB below the typical background level at the nearest residential noise sensitive location. The rating level will be inclusive of appropriate corrections for tonal/intermittent plant and will apply to all fixed plant associated with the Proposed Development at this location.

Emergency plant is understood to exclude plant such as smoke extract which would be in operational only during actual emergency or during regular testing.

## 3.3 LOCAL AUTHORITY PLANNING POLICY – LONDON BOROUGH OF CAMDEN

### THE CAMDEN LOCAL PLAN (2017)

The Camden Local Plan is the key strategic document in Camden’s development plan, setting out the vision for shaping the future of the Borough.

The document contains policies for guiding planning decisions. Pertinent to this application is Policy A4 which addresses noise and states:

*“We will only grant permission for noise generating development, including any plant or machinery, if it can be operated without causing harm to amenity.”*

With regard to noise from industrial and commercial sources, Appendix 3: Noise thresholds within the Camden Local Plan states:

*“A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. 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).”*

Table C within Appendix 3 (which has been reproduced below) aligns industrial and commercial noise to the lowest observed adverse effect level (LOAEL) and significant observed adverse effect level (SOAEL) thresholds. The LOAEL threshold is aligned with a rating level from industrial or commercial noise of 10 dB below the background level. As the LOAEL is (as set out within the Noise Policy Statement for England, 2010) the level above which adverse effects on health and quality of life can be detected, below this threshold it is considered that adverse effects would not occur.

**Table 3-1 - Appendix 3, Table C of Camden’s Local Plan: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)**

Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Garden used for main amenity (free-field) and Outside living or dining or bedroom window (façade)	Day	‘Rating level’ 10 dB* below background	‘Rating level’ between 9 dB below and 5 dB above background	‘Rating level’ greater than 5 dB above background
Outside bedroom window (façade)	Night	‘Rating level’ 10 dB* below background and no events exceeding 57 dB L <sub>Amax</sub>	‘Rating level’ between 9 dB below and 5 dB above background or noise events between 57 dB and 88 dB L <sub>Amax</sub>	‘Rating level’ between 9 dB below and 5 dB above background and/or events exceeding 88 dB L <sub>Amax</sub>
*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.				

It should be noted that the table above applies solely to residential properties (dwellings).

Concerning various types of NSRs, the following information is provided:

*“Levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises”.*

Additionally, the following in the Policy is said about emergency equipment:

*“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 (L<sub>90</sub> 15 minutes).”*

## CONSULTATION

Since the Fulwood Place site is surrounded by NSRs that include office buildings, WSP has requested clarification from the EHO via email (dated 26 July 2023) regarding the applicable noise level standards for commercial buildings. WSP have not received a response to this email and were not able to engage with the relevant EHO over the phone regarding this query.

Taking into consideration that commercial uses are slightly less noise sensitive than residential uses, an approach to limit the noise emission from the proposed new development to 5 dB below the background noise level (L<sub>A90,T</sub>) at the nearby commercial receptors is proposed at this stage.

### CAMDEN PLANNING GUIDANCE AMENITY (2021)

Camden Planning Guidance (CPG) Amenity, January 2021 includes a checklist of items which should be included within an acoustic report to support a planning application.

This checklist has been reproduced in Table 3-2 below with a reference to where the relevant information is provided within this report or where it is discussed why certain information is not necessary for this application.

**Table 3-2 - Camden Council Amenity CPG Checklist**

Checklist Item	Evidence
Description of the proposal	Section 1
Description of the site and surroundings, a site map showing noise and vibration sources and measurement locations	Section 2
Background noise levels measured over a minimum of 24 hours	Section 4.1
Details of instruments and methodology used for noise measurements (including reasons for settings and descriptors used, calibration details);	Section 4
Details of the plant or other source of noise and vibration both on plan and elevations and manufacturers specifications;	Section 5.1 explains why details on plant are not currently available
Noise or vibration output from proposed plant or other source of noise and vibration, including: - noise or vibration levels; - frequency of the output; and - length of time of the output.	Discussed in Section 5
Features of the noise or vibration e.g. impulses, distinguishable continuous tone, irregular bursts;	Discussed in Section 5
Specification of the plant, supporting structure, fixtures and finishes;	Section 5.1 explains why these details are not currently available
Location of noise sensitive uses and neighbouring windows;	Section 2
Details of measures to mitigate noise and vibration;	Section 5.2
Details of any associated work including acoustic enclosures and/or screening;	Noise mitigation measures are given in Section 5.2
Cumulative noise levels; and;	Section 5.1 explains why these details are not currently available
Hours/days of operation	Section 5.1 explains why these details are not currently available

### 3.4 BS 4142:2014+A1 2019

BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS 4142) provides typical guidance for assessing noise emissions from new items of building services plant against the existing background noise level at the nearest noise sensitive receptors.

The standard provides guidance as to how to derive the noise rating level for a source based on the character of the noise produced. The character of noise is rated using the penalties below:

- Tonality up to 6 dB
- Impulsivity up to 9 dB
- Other sound characteristics 3 dB
- Intermittency 3 dB

On the determination of a background sound level, BS 4142 states that the goal is to present a background sound level, over a suitable time period, which is representative of the typical noise environment, and considers the context of the noise sources effecting that environment. The statistical analysis provided as an example in BS 4142 presents the lowest most commonly occurring  $L_{A90,15m}$  value as the typical background sound level.

It suggests that if the noise rating level is greater than or equal to 10 dB higher than the existing background noise level ( $L_{A90}$  dB), it provides a likely indication of a significant adverse impact. If the level is 5 dB above the existing background noise level, it provides a likely indication of an adverse impact. Where the level doesn't exceed the background noise level it is an indication of having low impact.



## 4 ENVIRONMENTAL NOISE SURVEY

In order to inform the design, it is necessary to obtain the background noise levels representative of the nearest noise sensitive properties (to set building services noise emission limits relative to the existing levels in accordance with British Standard, Camden Council and City of London requirements).

Noise surveys have been conducted at both sites to determine prevailing background noise levels. This section details survey methodology and results.

Note on meteorological conditions: High winds can create additional sources of noise and can also affect the stability of measurement equipment. Precipitation, such as rain, can significantly influence measurements and equipment, particularly in urban environments. This impact is further compounded by the fact that traffic noise tends to intensify in wet conditions, primarily due to the interaction of car wheels with wet tarmac surfaces. Both wind and rain phenomenon have substantial implications for the accuracy and reliability of noise measurements and need to be taken into account. Therefore, data from both surveys has been verified against weather conditions and details of omitted data due to the increased risk of being affected by the weather, are presented in sections below for both sites.

### 4.1 38-41 FURNIVAL STREET

An unattended noise background noise survey was undertaken between 12<sup>th</sup> September 2023 and 21<sup>st</sup> of September 2023. Supplementary short-term measurements were also conducted on 14<sup>th</sup> September 2023 to support the assessment.

Measurements were carried out at the following locations to assess the ambient noise levels likely to affect the Proposed Development, and the existing background noise levels at the nearby noise sensitive receptors:

- Long-term measurement position 1 (LTMP1): located at the back of 38-41 Furnival Street in a close proximity to residential windows of 1-6 Dyer's Buildings. This location is deemed representative of NSRs at 1-6 Dyer's Buildings.
- Short-term measurement position 2 (STMP2): located in front of 38-41 Furnival Street at the façade of the office buildings at 10 Furnival Street and 9 Holborn. This location is considered representative of all the other identified NSRs, whose windows overlook Furnival Street.

These measurements were conducted at the location as shown on Figure 4-1.

LTMP1 was installed on the staircase, 5<sup>th</sup> floor, at the back of the existing office building at 38-41 Furnival Street. The microphone was mounted on a pole and positioned to be at least 1m away from any reflecting surfaces. The Figure 4-2 below shows equipment set-up at this position.

The sound level meter at STMP2 was installed on a tripod at a height of 1.5m above the ground and at least 1m away from any reflecting surfaces. The Figure 4-3 below shows the equipment during the measurements.

Both LTMP1 and STMP2 measurements are considered free-field.

Figure 4-1 - Noise measurement locations at 38-41 Furnival Street

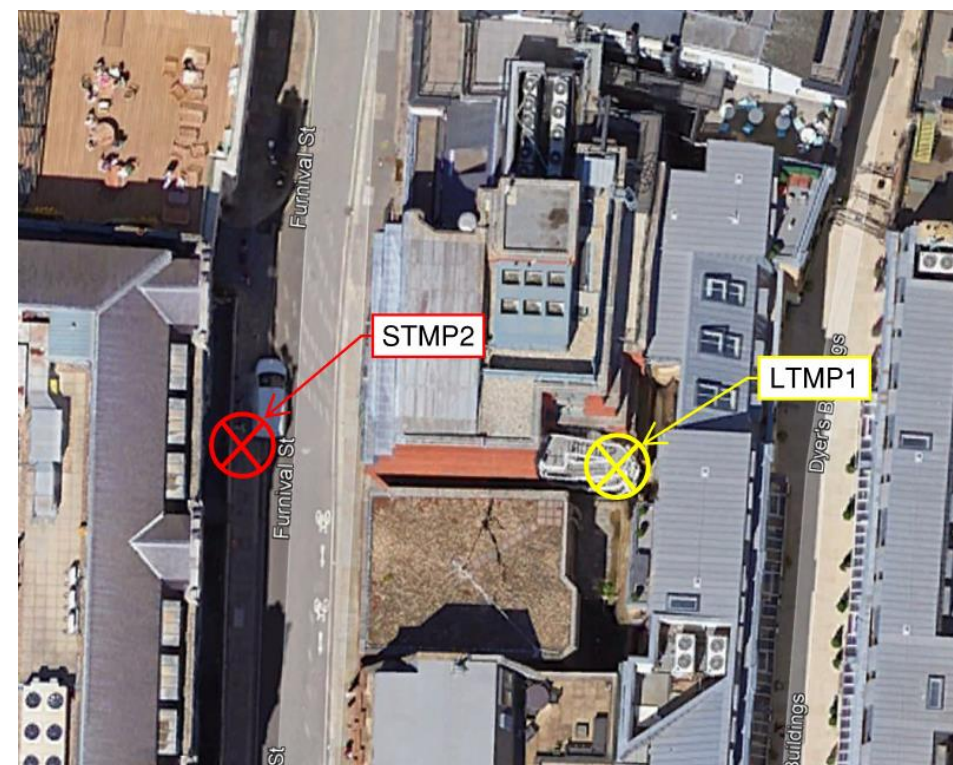


Figure 4-2 - Long-term equipment set-up at 38-41 Furnival Street

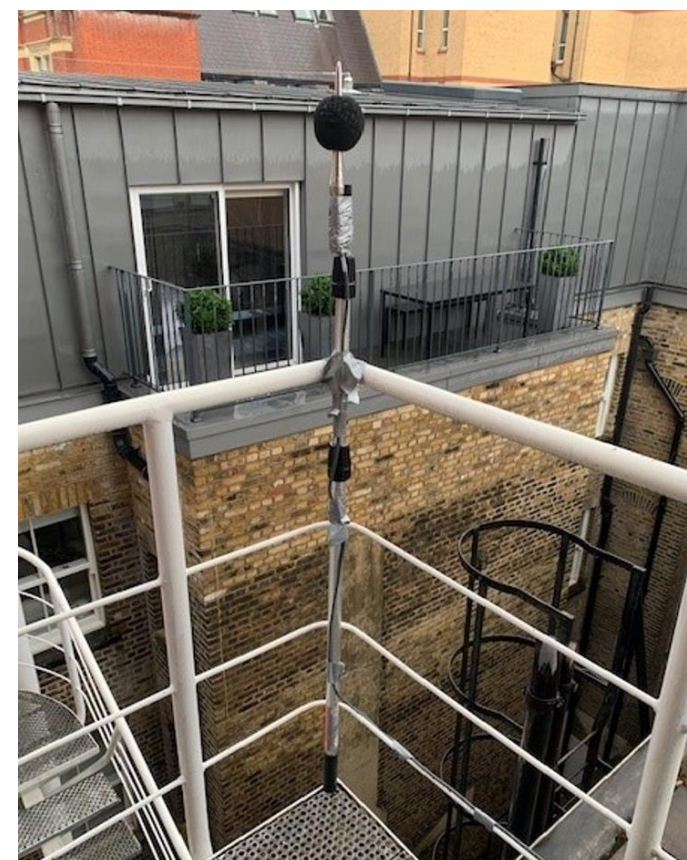




Figure 4-3 - Short-term equipment set-up at 38-41 Furnival Street



Measurement Equipment – 38-41 Furnival Street

Details of the noise monitoring equipment used to undertake the survey are presented below in Table 4-1.

Table 4-1 - Noise measurement equipment used for the survey at 38-41 Furnival Street

Description	Manufacturer and Model	Serial Number
Lond-term measurements at LTMP1		
Sound level meter	01dB-Stell Duo 'Datalogging Integrating Sound Level Meter'	10616
Pre-amplifier	01dB-Stell PRE 22 Preamplifier	10180
Microphone	G.R.A.S Type 40CD Condenser Microphone	154423
Calibrator	01dB Cal 21	34924053
Short-term measurements at STMP2		
Sound level meter	01dB-Metravib Fusion Sound Level Meter	10796
Pre-amplifier	01dB PRE22 Preamplifier	10882

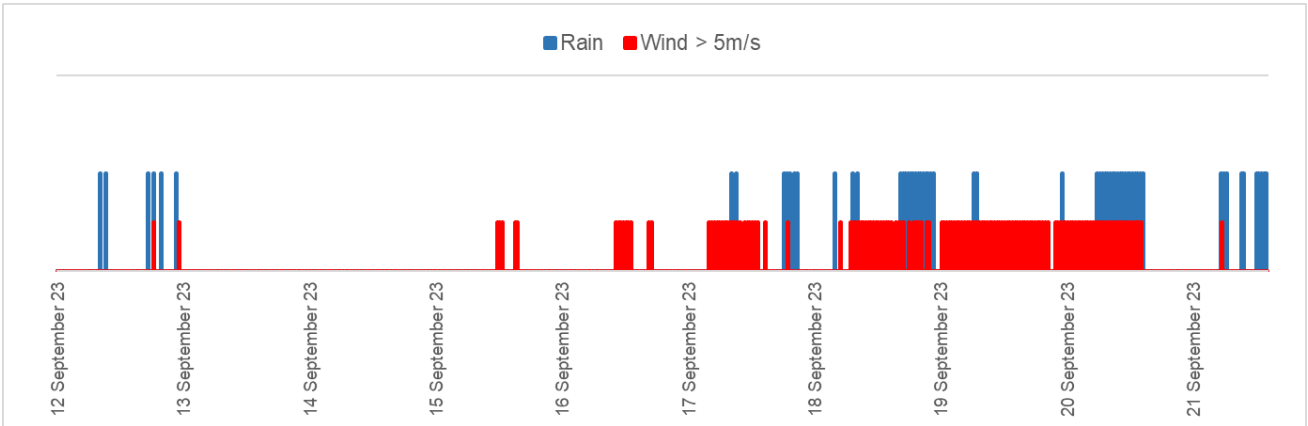
Description	Manufacturer and Model	Serial Number
Microphone	GRAS Type 40CD Condenser Microphone	207588
Calibrator	01dB-Stell Cal 21	34254632

Each meter had been calibrated by a UKAS accredited laboratory within the previous 24 months. The equipment was also field calibrated at the commencement and conclusion of each set of measurements using the above calibrators, which had themselves been calibrated by a UKAS accredited laboratory within the previous twelve months. No significant drift in the calibration signal was noted.

Meteoritical Conditions – 38-41 Furnival Street

The weather conditions were assessed following the survey, with historical data extracted from the London City Airport weather station on Weather Underground (<https://www.wunderground.com>). In cases where the data was deemed unsuitable due to high wind speeds (wind speed higher than 5 m/s) and precipitation, such information was deliberately excluded from the measurements. The details of omitted data are presented in the Figure 4-4.

Figure 4-4 - Weather conditions during long-term noise survey at 38-41 Furnival Street



Weather conditions during the attended short-term survey were observed to be conducive for noise measurements, with wind speeds below 5m/s and no rainfall.



### Noise Measurement Results – 38-41 Furnival Street

The findings of the unattended noise survey are detailed in the table below, with the comprehensive dataset available for reference in Appendix C.

**Table 4-2 – Unattended long-term noise survey results at 38-41 Furnival Street (free-field)**

Location	Date	Day	Typical Background Noise Level	
			Daytime (7:00-23:00) dB, L <sub>A90,1h</sub>	Night time (23:00-07:00) dB, L <sub>A90,15min</sub>
LTMP1	12/09/2023	Tue	50	45
	13/09/2023	Wed	50	44
	14/09/2023	Thu	51	44
	15/09/2023	Fri	50	44
	16/09/2023	Sat	46	44
	17/09/2023	Sun	45	49
	18/09/2023	Mon	51	Most data omitted due to weather conditions
	19/09/2023	Tue	Most data omitted due to weather conditions	
	20/09/2023	Wed		44
	21/09/2023	Thu	50	Most data omitted due to weather conditions

The attended measurements were intentionally conducted in simultaneous conjunction with the unattended measurements. Subsequently, the short-term measurement results were compared with the long-term measurements taken during the same period to identify any level difference between the two measurement locations (i.e. front and back of the 38-41 Furnival Street site). A comprehensive presentation of this comparison is provided in the table below.

**Table 4-3 – Long-term and short-term measurement comparison at 38-41 Furnival Street (free-field)**

Date	Time	LTMP1 – Unattended Background Noise Level dB, L <sub>A90,15-min</sub>	STMP2 – Attended Background Noise Level dB, L <sub>A90,15min</sub>	Difference dB
14/10/23	15:37	53	60	7
	15:52	52	60	8
	16:07	51	60	8
	16:22	52	59	8

The results above indicate that during the measured period, a minimum of 7 dB difference was measured between the two measurement positions. Since this difference is the lowest difference recorded, it is considered the worst-case scenario and it is assumed in this assessment that this difference consistently exists between the two positions.

More data and acoustic metrics are available upon request.

### 4.2 FULWOOD PLACE

An unattended background noise survey was undertaken between 3<sup>rd</sup> August 2023 and 9<sup>th</sup> of August 2023 at the following location to assess the ambient noise levels likely to affect the Proposed Development and the existing background noise levels at the nearby noise sensitive receptors:

- Measurement position 1 (MP1): located on a roof of a two-storey part of the building that is a part the site, Fulwood Place. This location is deemed representative of all surrounding NSRs.

Figure 2-2 below shows the location of the measurement position.

The microphone was mounted on a pole and positioned to be at least 1m away from any reflecting surfaces, thus considered free-field. The Figure 4-6 below shows equipment set-up at this position.

**Figure 4-5 - Noise measurement locations at Fulwood Place**



Figure 4-6 - Long-term equipment set-up at Fulwood Place



### Measurement Equipment – Fulwood Place

Details of the noise monitoring equipment used to undertake the survey are presented below in Table 4-4.

Table 4-4 - Noise measurement equipment used for the survey at Fulwood Place

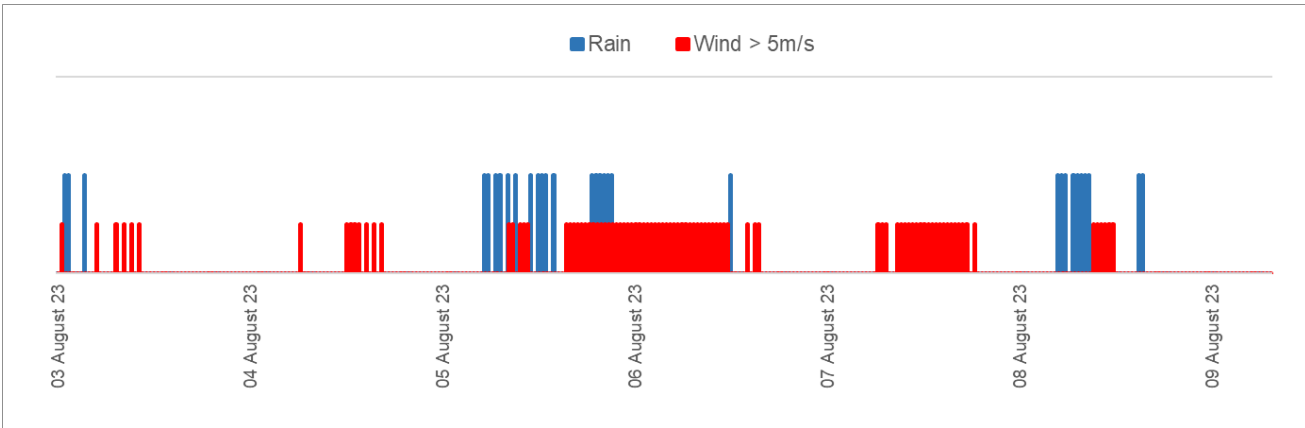
Description	Manufacturer and Model	Serial Number
Sound level meter	01dB-Stell Duo 'Datalogging Integrating Sound Level Meter'	10618
Pre-amplifier	01dB-Stell PRE 22 Preamplifier	10627
Microphone	G.R.A.S Type 40CD Condenser Microphone	331635
Calibrator	01dB-Stell Duo 'Datalogging Integrating Sound Level Meter'	10618

The meter had been calibrated by a UKAS accredited laboratory within the previous 24 months. The equipment was also field calibrated at the commencement and conclusion of each set of measurements using the above calibrators, which had themselves been calibrated by a UKAS accredited laboratory within the previous twelve months. No significant drift in the calibration signal was noted.

### Meteoritical Conditions – Fulwood Place

The weather conditions were assessed following the survey, with historical data extracted from the London City Airport weather station on Weather Underground (<https://www.wunderground.com>). In cases where the data was deemed unsuitable due to high wind speeds (wind speed higher than 5 m/s) and precipitation, such information was deliberately excluded from the measurements. The details of omitted data are presented in the Figure 4-4.

Figure 4-7 - Whether conditions during long-term noise survey at Fulwood Place



### Noise Measurement Results – Fulwood Place

The findings of the unattended noise survey are detailed in the Table 4-5 below, with the comprehensive dataset available for reference in Appendix C.

Table 4-5 – Unattended long-term noise survey results at Fulwood Place (free-field)

Location	Date	Day	Typical Background Noise Level	
			Daytime (7:00-23:00) dB, L <sub>A90,1h</sub>	Night time (23:00-07:00) dB, L <sub>A90,15min</sub>
MP1	03/08/2023	Thu	51	46
	04/08/2023	Fri	50	46
	05/08/2023	Sat	47	Most data omitted due to weather conditions
	06/08/2023	Sun	47	46
	07/08/2023	Mon	50	46
	08/08/2023	Tue	50	46
	09/08/2023	Wed	50	46

More data and acoustic metrics are available upon request.



# 5 ENVIRONMENTAL NOISE EMISSION

## 5.1 BUILDING SERVICES PLANT

Precise configuration and layout of the fixed plant equipment is yet to be finalised, and as such, a more comprehensive assessment of plant noise emissions will need to be conducted when these details are available at the later design stages. This will enable a more accurate determination of the potential impact on noise-sensitive receptors and the implementation of any necessary noise mitigation measures.

However, establishment of noise emission limits is a crucial step in ensuring that the TLT project complies with the relevant planning policies and regulations set forth by the CoL and LBC. These limits are designed to safeguard the acoustic environment of the surrounding areas and protect the amenity of nearby residents and commercial properties.

This section details building services noise emission limits that apply on all new fixed plant associated with the Scheme.

The noise limits outlined in this section may be subject to penalties related to noise characteristics, as determined by BS 4142, should it be considered applicable in the assessment of plant noise at subsequent stages.

### 38-41 FURNIVAL STREET

In line with City of London policy, the plant noise emission criteria are set to achieve 10 dB below the background noise level at nearby noise sensitive receptors.

The representative day and night-time background noise levels are presented, with the plant noise emission criteria in Table 5-1 below for building services plant associated with 38-41 Furnival Street at nearby NSRs.

Table 5-1 - Building services noise emission limits at 38-41 Furnival Street (façade)

Time Period	NSR Location	Adopted background level <sup>1</sup>	Plant noise emission limit at 1m from NSR façade*	Noise limit for emergency generators at NSR facade
Daytime (07:00 – 23:00)	1-6 Dyer’s Buildings	48 dB LA90,1h	38 dB LA <sub>r,T</sub>	38 dB LA <sub>r,T</sub>
	10 & 36-37 Furnival Street, 9 & 14-18 Holborn	55 dB LA90,1h	45 dB LA <sub>r,T</sub>	44 dB LA <sub>r,T</sub>
Night time (23:00 – 07:00)	1-6 Dyer’s Buildings	47 dB LA90,15mins	37 dB LA <sub>r,T</sub>	N/A **
	10 & 36-37 Furnival Street, 9 & 14-18 Holborn	54 dB LA90,15mins	44 dB LA <sub>r,T</sub>	N/A **
1 – 3 dB was added to the lowest background noise level to convert free-field measurement to a façade level (to account for façade reflections)				

\* where noise from the Proposed Development will not contain tones or be intermittent sufficient to attract attention  
 \*\* Emergency generators shall not be operational during the night

The noise emission limits for NSRs overlooking Furnival Street have been set out based on the adopted background noise levels with the 7 dB discrepancies applied due to their locations being at the front of the 38-41 Furnival Street building. All plant noise emission limits are given as cumulative free-field noise rating levels of all plant operating at normal maximum duties which should consider any corrections, as described in BS 4142, for the character of noise associated with the plant.

### FULWOOD PLACE

As discussed in the Section 3.1, Camden Council has not confirmed the specific noise limits that would apply to non-residential NSRs in the vicinity of the site. In light of this, it is proposed to adopt an approach to set the plant noise emission criteria to achieve 5 dB below the background noise level at nearby commercial receptors.

Given that the buildings surrounding the site are primarily commercial uses, it is assumed that the nearby commercial receptors are only occupied during the day. As such, only the daytime noise limits are presented for commercial receptors.

Table 5-2 below details building services noise emission limits associated with MP1 at Fulwood Place and are applied to all NSRs surrounding the site as described in Section 2.3.

Table 5-2 - Building services noise emission limits at Fulwood Place (façade)

Description	Residential		Commercial
	Daytime (07:00 – 23:00)	Night time (23:00 – 07:00)	Daytime (07:00 – 23:00)
Lowest Background Noise Level (façade) <sup>1</sup>	50 dB LA90,1h	49 dB LA90,1h	53 dB LA90,1h
Maximum emission level where noise from the Proposed Development <u>will not</u> contain tones or be intermittent sufficient to attract attention (façade)	40 dB LA <sub>r,T</sub>	39 dB LA <sub>r,T</sub>	48 dB LA <sub>r,T</sub>
Noise limit for emergency generators (façade)	60 dB LA <sub>r,T</sub>	59 dB LA <sub>r,T</sub>	63 dB LA <sub>r,T</sub>
1 – 3 dB was added to the lowest background noise level to convert free-field measurement to a façade level (to account for façade reflections)			

While the requirements for commercial receptors are less stringent than those for residential receptors, the proximity of the residential receptors to the site is closer than that of the offices. Therefore, it can be reasonably assumed that if the limits at the residential receptors are met, the requirements at the commercial receptors will also be satisfied.

All plant noise emission limits are given as cumulative free-field noise rating levels of all plant operating at normal maximum duties which should consider any corrections, as described in BS 4142, for the character of noise associated with the plant.

## **NOISE MITIGATION**

To comply with the limits specified in the sections above, all proposed equipment generating noise and vibration shall undergo an assessment. If the assessment reveals that these limits are exceeded, various noise and vibration mitigation measures could be implemented.

Such measures might include, but not limited to, installation of in-duct attenuators for fans (including AHU, extract fans, and emergency smoke extract fans), enclosing equipment that emits high noise levels within suitable housing or casing, and providing vibration isolation for all equipment susceptible to vibration.

The performance requirements of attenuators can be reduced by considering the design of ductwork, including bends, splits, and overall length. Therefore, it is strongly recommended to take these considerations into account when designing the ductwork system.

Whenever feasible, the terminations of atmosphere-side ductwork should be oriented away from the windows of the most noise-sensitive receptors.

Additionally, acoustic louvres may be employed in plant rooms where natural ventilation is required. To address noise breakout within indoor plant rooms, noise control can also be achieved by reducing reverberation time through the use of sound-absorbing materials.

## **5.2 OPERATIONAL NOISE EMISSIONS FROM UNDERGROUND TUNNELS**

At this stage, the specific usage of parts of the underground Tunnels is still in development. Some proposed uses for the space include a bar and exhibition rooms.

There are no residential or office noise-sensitive receptors directly adjacent to or in close proximity to the underground Tunnels. Therefore, noise breakout from the Tunnels via the ground is not considered a risk, as the soil provides sufficient mass to prevent noise from escaping.

Furthermore, the London Underground Central line Tunnels running directly above the underground Tunnels generate noise and vibration levels higher than those expected from the Proposed Development.

As for the possibility of noise escaping from the Tunnels and reaching noise-sensitive receptors located above ground, there is a significant distance between the underground Tunnels and the above-ground buildings because the Tunnels are situated deep underground. Consequently, it is not considered a risk for noise generated within the Tunnels to affect noise-sensitive receptors outside.

## 6 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

At this stage, contractors have yet to be appointed for the construction phase of the development. As such, method statements for the construction works are not yet available and a detailed assessment of potential noise and vibration impacts is not possible. A more comprehensive assessment of construction noise and vibration effects will be conducted when details are available at the later design stages. This will enable a more accurate determination of the potential impact on noise and vibration sensitive receptors and assessment of the required mitigation measures to ensure that any identified impacts can be minimised.

However, consideration of the relevant planning policies and regulations set forth by the CoL and LBC is necessary to ensure that potential impacts can be controlled to protect the amenity of nearby residents and commercial properties.

### 6.1 PLANNING POLICY AND GUIDANCE

#### CITY OF LONDON

The CoL's *Code of Practice for Deconstruction and Construction Sites* (Ninth Edition, Jan 2019) provides "a notice of the City of London's general requirements under Section 60 of the *Control of Pollution Act 1974*. The contractor may also be informed of additional requirements during consultations with the City of London".

The Code of Practice provides guidance on working hours, the use of best practicable means to control noise and vibration, and also some guidance on noise and vibration limits (often by reference to British Standards such as BS 5228 and BS 7385).

The Code of Practice recognises that those affected by noise and vibration may include commercial and retail premises as well as residential neighbours. The Code of Practice states that "for complex sites with a neighbour mix including residential, retail and commercial properties, advance negotiation with all parties and the Pollution Control Team (of CoL) is expected".

With regard to structure-borne noise, the Code of Practice states that "structurally transmitted noise affecting neighbours will be barred between 09.00 – 17.00 hours".

#### LONDON BOROUGH OF CAMDEN

Guidance is set out in the documents *Guide for Contractors Working in Camden* (Feb 2008) and *Camden Minimum Requirements* (date of publication unknown). Like the CoL guidance, reference is made to the use of best practicable means and to British Standards such as BS 5228, BS 6472 and BS 7385. The *Guide for Contractors Working in Camden* encourages the contractor to apply for prior consent under Section 61 of the *Control of Pollution Act*, and the agreement of Construction Management Plans to reduce noise and vibration impacts.

The *Camden Minimum Requirements* document states that "special attention should be given to structure-borne noise (vibration) due to any underground structures" and sets vibration limits for such activities at 1 mm/s peak particle velocity (PPV) for residential properties and 2 mm/s PPV for commercial properties.

### 6.2 FULWOOD PLACE

The works at Fulwood Place will involve alterations to the existing structure to facilitate a new pedestrian entrance at Fulwood Place, allowing for a secondary visitor attraction entrance. Alterations to the existing structure include forming openings in the 'pillbox' structure that surrounds the existing tunnel shafts. Structural alterations are limited to the Ground and Basement floors. No alterations are proposed to the building above the 'Pillbox' at ground floor.

No detailed method statements for the works are available at this stage. It is understood that there is an intention to pursue a Section 61 application following later design stages when method statements become available, and at that point an acoustic review of construction works at Fulwood Place will be undertaken.

### 6.3 FURNIVAL STREET

The works at 39 and 38-41 Furnival Street are to include demolition of the existing buildings to enable construction of a new five storey building with a three-storey basement. It is assumed the basement will replace the existing shaft and connect into the upper existing Tunnels. It is proposed that the shaft diameter will be increased below the new basement to the lower-level Tunnels; along with modification to the connecting tunnel at base to increase clear width. The 38-41 Furnival Street site is also expected to be used for supply and removal of materials associated with the proposed works within the underground Tunnels.

Again, no detailed method statements for the works are available at this stage. An acoustic review of the deconstruction and construction works at 38-41 Furnival Street, taking into account the relevant CoL guidance, will be undertaken when method statements become available.

### 6.4 TUNNEL NETWORK

In addition to the above, various works are proposed within the tunnel network. This will include the removal of some concrete tunnel linings and the breaking out of bulkheads and other structures at various locations throughout the tunnel network.

As with the works at Fulwood Place and Furnival Street, no detailed method statements are available. However, because the works will be slightly unusual in that they could generate structure-borne noise and vibration (rather than airborne noise) and that such noise and vibration could potentially affect a large number of receptor locations above the tunnel network, an attempt has been made to quantify the potential noise and vibration impacts. The guidance of both CoL and LBC identifies that special attention should be given to the issue of structure-borne noise and vibration.

In the absence of detailed method statements and information, these predictions are necessarily based on many assumptions, which are detailed below. These predictions would need to be updated at a later design stage when method statements and further information (e.g., ground conditions / geotechnical data) becomes available.

These initial calculations are based on the following assumptions:

- The most significant source of groundborne / structure-borne noise and vibration will be the breaking out of concrete tunnel linings and other concrete structures within the Tunnels.



- Because of the need to minimise occupational exposure to hand-arm vibration, the breaking out works will be undertaken by a machine mounted breaker (e.g., a mini-excavator with hydraulic / pneumatic breaker attachment) rather than hand-held breakers or jackhammers. Alternative methods such as hydraulic bursting should be considered and employed wherever practicable, but the use of machine mounted breakers is considered as a worst case.
- These works may occur at any location within the tunnel network. As such the number of potential receptor locations is high. The susceptibility of each receptor location will depend on the design of the building, in particularly the depth of the building foundations / basement levels and their proximity to the structures being broken out. Details are not known at this stage, but given the age and construction of the building stock along Holborn, it is unlikely that the buildings are constructed on deep piled foundations. Given the depth of the Tunnels, it is assumed that the foundations of most buildings will not encroach within approximately 8m of the Tunnels or areas at which breaking out works will be undertaken. However, because the distance between the breaking out works and the building foundations is unknown, calculations have been undertaken for a range of assumed distances.
- The source data used in the calculations is taken from a measurement database of similar activities, as measured by WSP. Specifically, the source data is taken from vibration measurements undertaken during the breaking out of concrete at a site in Sheffield. This data includes measurements spanning the frequency range 1.6 Hz to 500 Hz, which covers the range of perceptible ground-borne vibration and structure-borne noise (the source data found no significant energy at frequencies above 500 Hz).
- In the absence of detailed geotechnical data, the assumed physical properties of the intervening soils between the Tunnels and the building foundations (shear wave speeds, soil damping loss factors) are based on typical properties for London clay.
- Any attenuation of groundborne noise and vibration due to coupling losses between the building foundations and the soil will be offset by potential amplifications within the above ground structures (e.g., resonances of internal floors and other building elements). As such, it is assumed that vibration levels calculated for the soil directly beneath the building will be the same as that experienced within the building.
- Calculations are undertaken for each one-third octave frequency band between 1.6 Hz and 500 Hz. From this data, the overall levels of groundborne vibration are calculated as the peak particle velocity (PPV) vibration level between 1.6 Hz and 80 Hz (covering the range relevant to human perception of tactile vibration). The overall levels of groundborne noise are calculated as the A-weighted maximum noise level ( $L_{As,max}$ , dB).

The results of these initial calculations are presented in Table 6-1.

**Table 6-1 - Building services noise emission limits at 38-41 Furnival Street**

Distance between breaking out works and building foundations, m	Ground-borne noise level, dB $L_{As,max}$	Ground-borne vibration, mm/s PPV
8	56.3	0.50
12	52.1	0.32
16	48.4	0.22
20	45.1	0.15
24	42.0	0.11
28	39.0	0.08
32	36.1	0.06

In terms of acceptability, the predicted levels of groundborne / structure-borne vibration are below the limits specified by London Borough of Camden for commercial properties. Although CoL provides no specific guidance, it does reference BS 5228-2 and the predicted levels are below the BS 5228-2 guidance that would normally be applied to commercial properties. It is noted that lower thresholds for groundborne vibration would apply to particularly sensitive building uses (e.g., housing medical imaging equipment or other vibration sensitive equipment), although no such building uses have been identified within the area above the Kingsway Tunnels.

Neither London Borough of Camden or City of London have specified acceptable limits for groundborne / structure-borne noise, although both emphasise that special attention needs to be given to structure-borne noise. There is also no specific guidance within the available British Standards, and in the absence of such guidance the Association of Noise Consultants *Guidelines on the Measurement and Assessment of Groundborne Noise and Vibration* makes reference to the criteria adopted for recent underground rail schemes, such as Crossrail and (more recently) HS2 (which pass through / beneath both Camden and CoL). For groundborne noise during the construction phase (e.g., due to tunnel boring) limits of 45 dB would typically represent the threshold of a significant effect.

From the results presented above, groundborne levels exceeding 45 dB are only predicted to occur when breaking out works are undertaken within approximately 20 m of the building foundations. Although the works could be undertaken within any part of the Tunnels complex, works within 20 m of the foundations of any particular receptor building would be of limited duration. As such, any potential groundborne noise impact would be limited.

A more detailed assessment should be undertaken at the later design stages as method statements for the works become available.

## 7 CONCLUSION

---

WSP has been commissioned to provide acoustic consultancy services associated with the proposed The London Tunnels project in Holborn, central London. The Scheme comprises two above-ground sites and redevelopment of existing underground telecom Tunnels located over two London boroughs: Camden Council and the City of London.

A baseline Environmental Noise Survey has been undertaken at both above ground sites to establish the existing noise levels affecting The Site and surrounding area.

Using these measured noise levels and noise criteria taken from relevant local authority planning policies, noise emission criteria have been set for all nearby noise sensitive receptors for any fixed building services plant associated with the development.

The proposed configuration and layout of plant will not be fixed until later in the design. A further assessment of the plant noise emissions will be required when details of the plant are known.

Due to the long distance between the underground Tunnels and the above-ground buildings as well as the fact that there is a London Underground Central line Tunnels running directly above the underground Tunnels generating levels of noise and vibration higher than the Proposed Development would, operational noise from the proposed use of the Tunnels would be negligible at the nearest neighbouring above ground properties.

Outline assessment of noise and vibration associated with the Proposed Development has also been undertaken to assess the potential impact at neighbouring buildings to the site.

Considering all of the above, there is no reason from a noise and vibration perspective that the Proposed Development should not be granted planning permission.

# Appendix A

## GLOSSARY OF ACOUSTIC TERMINOLOGY



Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or  $L_{Aeq}$ ,  $L_{A90}$  etc, according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table:

Typical sound levels found in the environment

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

Technical glossary

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

# Appendix B

## NATIONAL PLANNING GUIDANCE





## NOISE POLICY STATEMENT FOR ENGLAND

The Noise Policy Statement for England (NPSE) was published by Defra in March 2010. This NPSE sets out the long-term vision of Government noise policy:

*“Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.”*

The NPSE long term vision is supported by the following aims:

*“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *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.”*

## NATIONAL PLANNING POLICY FRAMEWORK

The National Planning Policy Framework was revised in July 2018, the updated document replaces the original version published in March 2012.

The NPPF states:

*“130. Permission should be refused for development of poor design that fails to take the opportunities available for improving the character and quality of an area and the way it functions, taking into account any local design standards or style guides in plans or supplementary planning documents. Conversely, where the design of a development accords with clear expectations in plan policies, design should not be used by the decision-maker as a valid reason to object to development. Local planning authorities should also seek to ensure that the quality of approved development is not materially diminished between permission and completion, as a result of changes being made to the permitted scheme (for example through changes to approved details such as the materials used).*

*170. Planning policies and decisions should contribute to and enhance the natural and local environment by;*

*[...]*

*e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;*

*180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

*a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*

*b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;*

*[...]*

*182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”*

## LONDON PLAN

Policy 7.15 of the London plan states the following regarding planning decisions:

*“Development proposals should seek to manage noise by:*

*Avoiding significant adverse noise impacts on health and quality of life as a result of new development;*

- *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 development or adding unduly to the costs and administrative burdens on existing businesses;*
- *Improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity);*
- *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 or internal layout – in preference to sole reliance on sound insulation;*
- *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;*
- *Having particular regard to the impact of aviation noise on noise sensitive development;*
- *Promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.”*

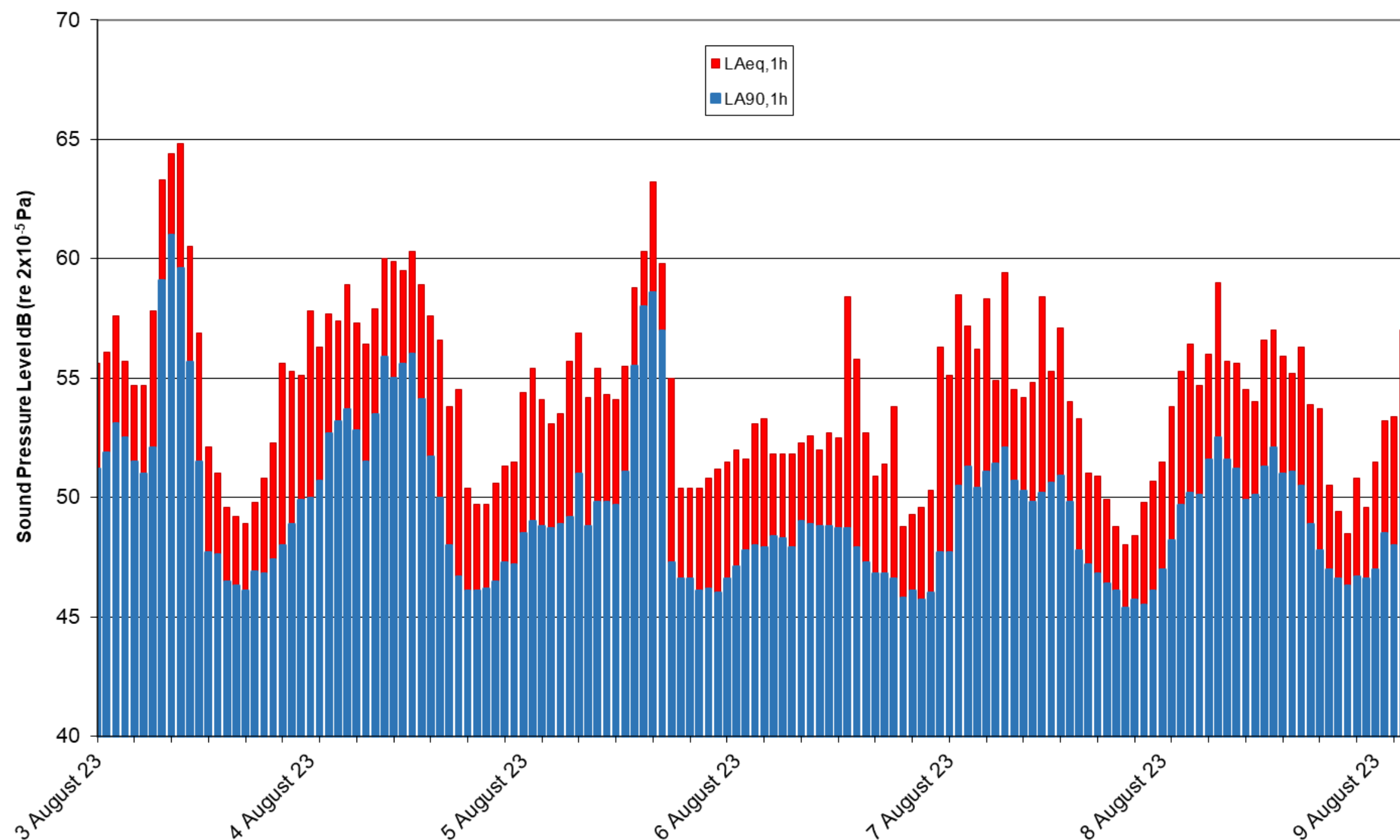
# Appendix C

## SURVEY DATA



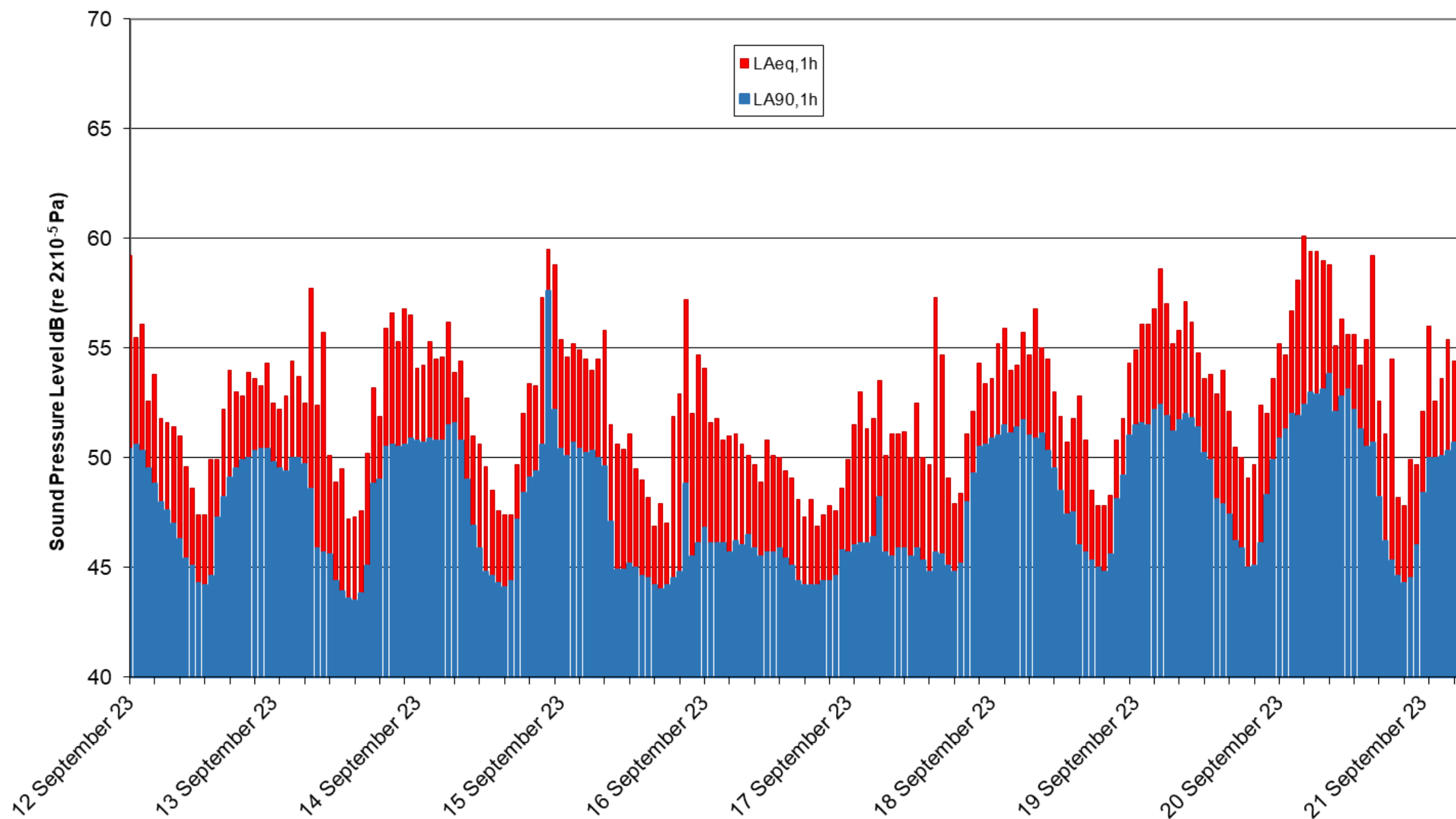
# FULWOOD PLACE – LONG-TERM MEASUREMENT POSITION 1 – MP1

## Environmental Noise Monitoring Measured $L_{Aeq}$ and $L_{A90}$ Noise Levels



# 38-41 FURNIVAL STREET – LONG-TERM MEASUREMENT POSITION 1 – LTMP1

## Environmental Noise Monitoring Measured $L_{Aeq}$ and $L_{A90}$ Noise Levels



38-41 FURNIVAL STREET – SHORT-TERM MEASUREMENT POSITION 2 – STMP2

Date	Time	Background Noise Level dB, L <sub>A90,5min</sub>	Ambient Noise Level dB, L <sub>Aeq,5min</sub>
14/09/2023	15:37	61	69
	15:42	60	63
	15:47	60	63
	15:52	60	63
	15:57	61	65
	16:02	60	63
	16:07	60	62
	16:12	60	64
	16:17	60	63
	16:22	60	63
	16:27	60	62
	16:32	60	63

38-41 FURNIVAL STREET – COMPARISON BETWEEN LTMP1 AND STMP2, L<sub>A90,1MIN</sub>

