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AAD
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acoustic
design

TRAVELODGE, 10 DRURY LANE

COVENT GARDEN, LONDON

WC2B 5RE

ENVIRONMENTAL SOUND LEVEL SURVEY

AND

PLANT NOISE ASSESSMENT

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1.0 Introduction

1.1 An environmental sound level survey has been undertaken to determine the prevailing background sound levels with respect of existing ambient and background sound levels at noise sensitive properties close to the Travelodge Hotel at 10 Drury Lane, London, WC2B 5RE.

1.2 A plant noise assessment has been carried out with respect of those noise sensitive properties having regard to proposed changes to the mechanical services plant serving the Travelodge. The assessment has been undertaken in line with the planning policy requirements stipulated by the Local Authority (London Borough of Camden).

1.3 Sound levels arising from the proposed mechanical services plant have been assessed against the applicable limits and guidance regarding suitable noise control measures provided, where necessary.

2.0 Site Description

2.1 The Travelodge hotel has one section at right angles to Drury Lane which is 5 storeys in height, a taller 9 storey section on Drury Lane itself and an "L" shaped 5 storey section on Short's Garden. The works include the replacement of existing services plant with new and additional units and the relocation of others. The proposed plant is intended to provide supplementary cooling/heating.

2.2 The building is bound by Drury Lane to the northwest, Short's Garden to the southeast, Dudley Court (a residential building) to the southwest and High Holborn Residential (a residential building) to the northwest. The location of the nearest noise sensitive properties are residential above commercial premises and Drury Lane and High Holborn Residential.

2.3 See Appendix 1 for the site plan, measurement locations and proposed mechanical services plant locations.

3.0 Site Sound Survey

3.1 Instrumentation: Svantek 948 (serial no. 9310) with associated pre-amplifier and microphone and an NTi Audio XL2 (serial no. 6871), both sound level meters are Class 1 and have current certificates of calibration (certificate can be issued upon request). Both meters were checked for correct calibration at site prior and subsequent to use with a Larson Davis type CA 250 calibrator whereupon no calibration drift was recorded. The instrument was powered by external batteries and stored in a weather proof case. The instruments were used in accordance with manufacturer's instructions.

3.2 Location: The Svantek sound level meter was located at ground floor level close to the loading dock area of the Travelodge opposite Dudley Court, with the microphone being fixed to a tripod at approximately 2.5m above ground level. The NTi Audio XL2 was located on a flat roof area above the Café de Provence on Drury Lane, with the microphone being fixed to a tripod at approximately 2.0m above roof level

3.3 Period: The sound level meters were configured to operate continuously from approximately 14:00 hrs on Tuesday 29th November 2022 until approximately 16:30 hrs on Monday 5th December 2022. The meters were configured to log sound levels continuously in fifteen-minute intervals.

3.4 Weather: The prevailing weather conditions over the survey period were dry and calm. Wind speed, although not recorded, was considered to be less than 5 m/s throughout the survey period, based upon observed conditions at the time of deployment and collection of the equipment and historical weather data.

3.5 Site Sound Characteristics: The background and ambient sound levels are controlled at by existing mechanical services plant on neighbouring buildings and vehicle movements from the surrounding roads.

It is assumed that no unusual events occurred during the survey period, and the data includes a fair representation of the sound levels in the area.

3.6 Surveyor: Jay Butler AMIoA

3.7 Results: The results of the measurements are summarised below in Tables 1 & 2, showing the recorded values of background sound level (L_{A90} dB) and ambient sound level (L_{Aeq} dB) respectively. Refer to Appendix 1 for the measurement location and Appendix 2 for the survey measurement data in graphical form.

Table 1: Drury Lane Lowest Sound Measurement Results

Drury Lane	**Daytime (07:00-19:00)**	**Evening (19:00-23:00)**	**Night-time (23:00-07:00)**
Background	58 dB $L_{A90, t}$	50 dB $L_{A90, t}$	50 dB $L_{A90, t}$
Ambient	65 dB $L_{Aeq, t}$	53 dB $L_{Aeq, t}$	51 dB $L_{Aeq, t}$

Table 2: Dudley Court Lowest Sound Measurement Results

Dudley Court	**Daytime (07:00-19:00)**	**Evening (19:00-23:00)**	**Night-time (23:00-07:00)**
Background	52 dB $L_{A90, t}$	51 dB $L_{A90, t}$	46 dB $L_{A90, t}$
Ambient	60 dB $L_{Aeq, t}$	57 dB $L_{Aeq, t}$	54 dB $L_{Aeq, t}$

3.8 See Appendix 3 for a glossary of terms.

4.0 Plant Noise Criteria

4.1 The site falls into the jurisdiction of the London Borough of Camden. Their planning policies are set out in the adopted Camden Local Plan Local dated 2017. In particular Policy A4 DP28 Noise and Vibration which refers to Camden's noise and vibration thresholds which are set out in Appendix 3 of the adopted local plan. Appendix 3, on page 313, sets the noise threshold values for non-anonymous noise set out below:

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dB L_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dB L_{Amax}

**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.*

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

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

4.2 Based on the policy wording set out above, the residual plant noise level arising from the operation of the proposed plant must be at least 10 dB lower than the prevailing typical background sound levels. The appropriate criteria are as follows:

Table 3: Plant Noise Limiting Criteria at nearest noise sensitive facade.

	Period	Maximum Plant Noise Level
Drury Lane	Daytime (07:00 to 23:00)	48 dB L_{Aeq}
	Night (23:00 to 07:00)	40 dB L_{Aeq}
Dudley Court	Daytime (07:00 to 23:00)	42 dB L_{Aeq}
	Night (23:00 to 07:00)	36 dB L_{Aeq}

4.3 If the proposed plant is likely to emit any distinguishable, discrete continuous notes (whine, hiss, screech, hum), or possess any distinct impulses (bangs, clicks, clatters, thumps), then the values of L_{Aeq} shown above must be reduced by a further 5 dB.

4.4 Reference is made to an NR35 criterion where the noise sensitive premise are located in a quiet background area. The typical background sound level for the area, as reported in the National Noise Incidence studies of 1990 and 2000 and the DEFRA report FNM 2013 "*Comparison with previous Noise Attitude, Noise Incidence, and London Noise surveys*" the typical background sound level for "*Greater London*", which includes for these surveys the Camden area. The values are as shown below:

Table 4: Mean Background Sound Levels.

Survey Date	Daytime ($L_{A90,\ 12\ hr}$)	Night ($L_{A90,\ 8\ hr}$)
NNI 1990	46 dB	38 dB
NNI 2000	47 dB	38 dB
FNM 2013	47 dB	37 dB

4.5 As can be seen from the values given above for the mean background sound levels for the survey area, the lowest measured background sound levels of 49 dB $L_{A90,\ 16\ hr}$ day and 46 dB $L_{A90,\ 8\ hr}$ night, are greater than the mean values for the survey area. On this basis therefore the adjacent noise sensitive properties are not *located in a quiet background area* and consequently the NR35 criterion does not apply.

4.6 In addition to the above, as there is existing consented plant associated with the Travelodge, the design intent should be to ensure that there is no increase in existing noise levels at adjacent properties.

5.0 Plant Noise Assessment

5.1 Given the distribution of the proposed plant around the hotel, only some of the plant is expected to give rise to noise at the two receiver locations, Drury Lane and Dudley Court. The plant likely to give rise to noise at the two locations are as given below:

Table 5: DRURY LANE Plant Sound Power Levels

Plant Item	Octave band centre frequency (Hz)								A-weighted Sound Level, L_{wA}, dB
	63	125	250	500	1k	2k	4k	8k	
	Sound Power Level, dB re 1 x 10^{-12} W								
1No. Ruck MPC 500 EC 40/157916 purge fan (SK101A)	68	77	70	70	65	60	56	50	71
4No. Lossnay LGH-RVX-E HRV (in duct) (SK103)	38	50	55	57	60	57	50	43	63

Table 6: DUDLEY COURT Plant Sound Power Levels

Plant Item	Octave band centre frequency (Hz)								A-weighted Sound Level, L_{wA}, dB
	63	125	250	500	1k	2k	4k	8k	
	Sound Power Level, dB re 1 x 10^{-12} W								
4No. Systemair bathroom extract fans (SK102)	65	84	80	81	81	77	72	64	88
6No. Samsung VRF condensers (SK101A)	62	72	72	74	73	67	72	61	78

5.2 Based on the proposed mechanical plant scheme location, it has been determined that the identified distance and line of sight between the plant and receiver will be as follows:

Table 7: Distance and Line of Sight of the Proposed Plant to the Nearest Receivers

Nearest Noise Sensitive Property Location	Approx. Distance between Plant and Receiver	Receiver Field of View of Proposed Plant
Drury Lane (1st floor and above)	11 m	Line of sight
Dudley Court (1st floor and above)	13 m	Line of sight

5.3 The proposal includes in-duct attenuators for the bathroom extract fans with the acoustic performance given below:

Table 8: Bathroom extract fan attenuator performance

Plant Item	Octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
	Insertion loss dB							
Bathroom extract attenuator	3	4	8	18	23	17	15	12

5.4 Calculations have been performed, based upon the information provided, in order to determine the likely plant sound level at the identified noise sensitive property. This has taken into account any attenuation due to distance, screening by building features, and any likely increase in sound level due to acoustic reflections. Summaries of the assessment calculations are set out below:

Drury Lane:

Table 9 – Plant Noise Assessment - Day

Description	A-weighted Calculation
Day Assessment	
Ruck exhaust Air-Louvre at 1m	**61 dB**
Distance attenuation (plane source radiation, 28m)	-29 dB
Building Reflections	+3 dB
Predicted L_p at 1m from receiver	**35 dB**
Lossnay Exhaust Air-Louvre limit at 1m	**56 dB**
Distance attenuation (plane source radiation, 28m)	-29 dB
Building Reflections	+3 dB
Correction for 4 off	+6 dB
Predicted L_p at 1m from receiver	**36 dB**
Lossnay Intake Air-Louvre limit at 1m	**53 dB**
Distance attenuation (plane source radiation, 28m)	-29 dB
Building Reflections	+3 dB
Correction for 4 off	+6 dB
Predicted L_p at 1m from receiver	**33 dB**
Total predicted L_p at 1m from the Nearest Noise Sensitive Facade	**40 dB**
Prevailing Background Sound Level	**58 dB**
Difference	**-18 dB**

Table 10 – Plant Noise Assessment – Night

Description	A-weighted Calculation
Day Assessment	
Ruck exhaust Air-Louvre at 1m	**61 dB**
Distance attenuation (plane source radiation, 28m)	-29 dB
Building Reflections	+3 dB
Predicted L_p at 1m from receiver	**35 dB**
Lossnay Exhaust Air-Louvre limit at 1m	**56 dB**
Distance attenuation (plane source radiation, 28m)	-29 dB
Building Reflections	+3 dB
Correction for 4 off	+6 dB
Predicted L_p at 1m from receiver	**36 dB**
Lossnay Intake Air-Louvre limit at 1m	**53 dB**
Distance attenuation (plane source radiation, 28m)	-29 dB
Building Reflections	+3 dB
Correction for 4 off	+6 dB
Predicted L_p at 1m from receiver	**33 dB**
Total predicted L_p at 1m from the Nearest Noise Sensitive Facade	**40 dB**
Prevailing Background Sound Level	**50 dB**
Difference	**-10 dB**

Dudley Court: (NOTE: the condensers are located in an undercroft area)

Table 11 – Plant Noise Assessment - Day

Description	A-weighted Calculation
Day Assessment	
Bathroom exhaust Air-Louvre at 1m	**51 dB**
Distance attenuation (plane source radiation, 12m)	-22 dB
Building Reflections	+3 dB
Correction for 3 off	+5 dB
Predicted L_p at 1m from receiver	**37 dB**
Condenser at 1m	**53 dB**
Distance attenuation (plane source radiation, 12m)	-27 dB
Building Reflections	+3 dB
Correction for 6 off	+8 dB
Predicted L_p at 1m from receiver	**37 dB**
Total predicted L_p at 1m from the Nearest Noise Sensitive Facade	**40 dB**
Prevailing Background Noise Level	**52 dB**
Difference	**-12 dB**

Table 12 – Plant Noise Assessment – Night

Description	A-weighted Calculation
Day Assessment	
Bathroom exhaust Air-Louvre at 1m (assuming 50% on-time)	**48 dB**
Distance attenuation (plane source radiation, 18m)	-22 dB
Building Reflections	+3 dB
Correction for 3 off	+5 dB
Predicted L_p at 1m from receiver	**34 dB**
Condenser at 1m (assuming 20% on-time)	**46 dB**
Distance attenuation (plane source radiation, 12m)	-27 dB
Building Reflections	+3 dB
Correction for 6 off	+8 dB
Predicted L_p at 1m from receiver	**30 dB**
Total predicted L_p at 1m from the Nearest Noise Sensitive Facade	**35 dB**
Prevailing Background Noise Level	**46 dB**
Difference	**-11 dB**

5.5 At night there are assumed typical on-times for the bathroom fans and the condenser units. These are based upon the night time demands on these items of plant being much reduced at night due to cooler night time air temperatures and reduced use of bathrooms and showers.

5.6 The calculated receiver noise spectra do not indicate that there should be any observable tonal content to the noise. This is typical of air-movement plant with the noise typically being broadband in nature. With the external calculated noise levels being at least 10 dB below existing background noise levels it is also the case that, within residential properties even with windows open, noise from the proposed plant should tend towards inaudibility.

5.7 Given the above, there is no indication that any acoustic penalty should be applied with respect of noise from the proposed plant. It is therefore concluded that the proposed plant should be in compliance with Camden's policy requirements.

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6.0 Conclusion

6.1 A survey has been undertaken at the Travelodge Hotel, 10 Drury Lane, Camden, WC2B 5RE to establish prevailing levels of background sound at and around the site.

6.2 Noise emission criteria for plant associated with the development proposal have been derived, based upon London Borough of Camden's planning policy (DP28 Noise and Vibration) for plant and machinery.

6.3 Based upon the plant selections provided, an assessment of the likely levels of noise at adjacent noise sensitive properties has been made, having regards to Camden's planning policy.

6.4 The result of the assessment is that the calculated levels of noise are such that the proposed plant can be expected to comply with Camden's planning policy.

Appendix 1: Proposed Plant and Noise Sensitive Receiver Location

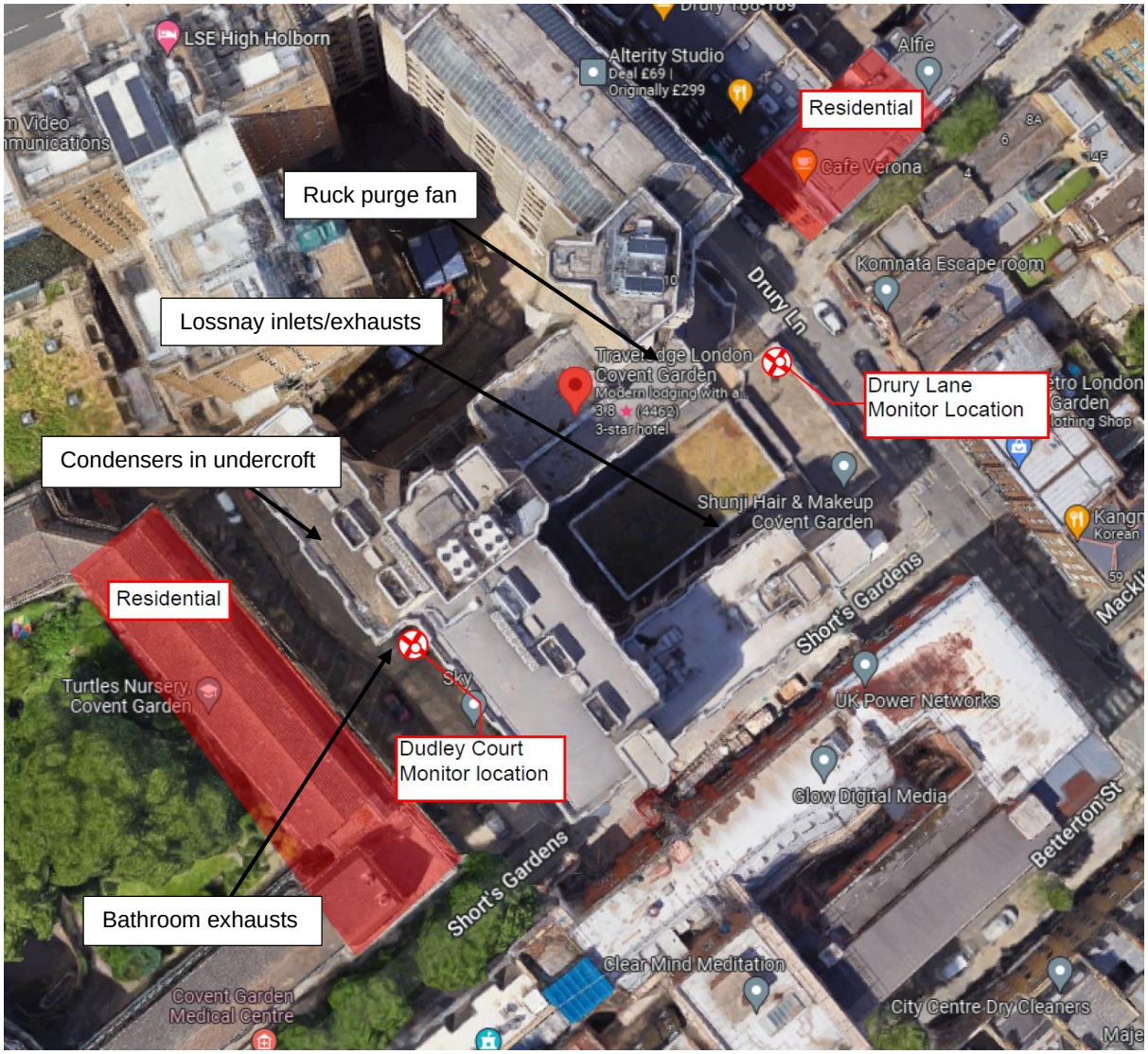
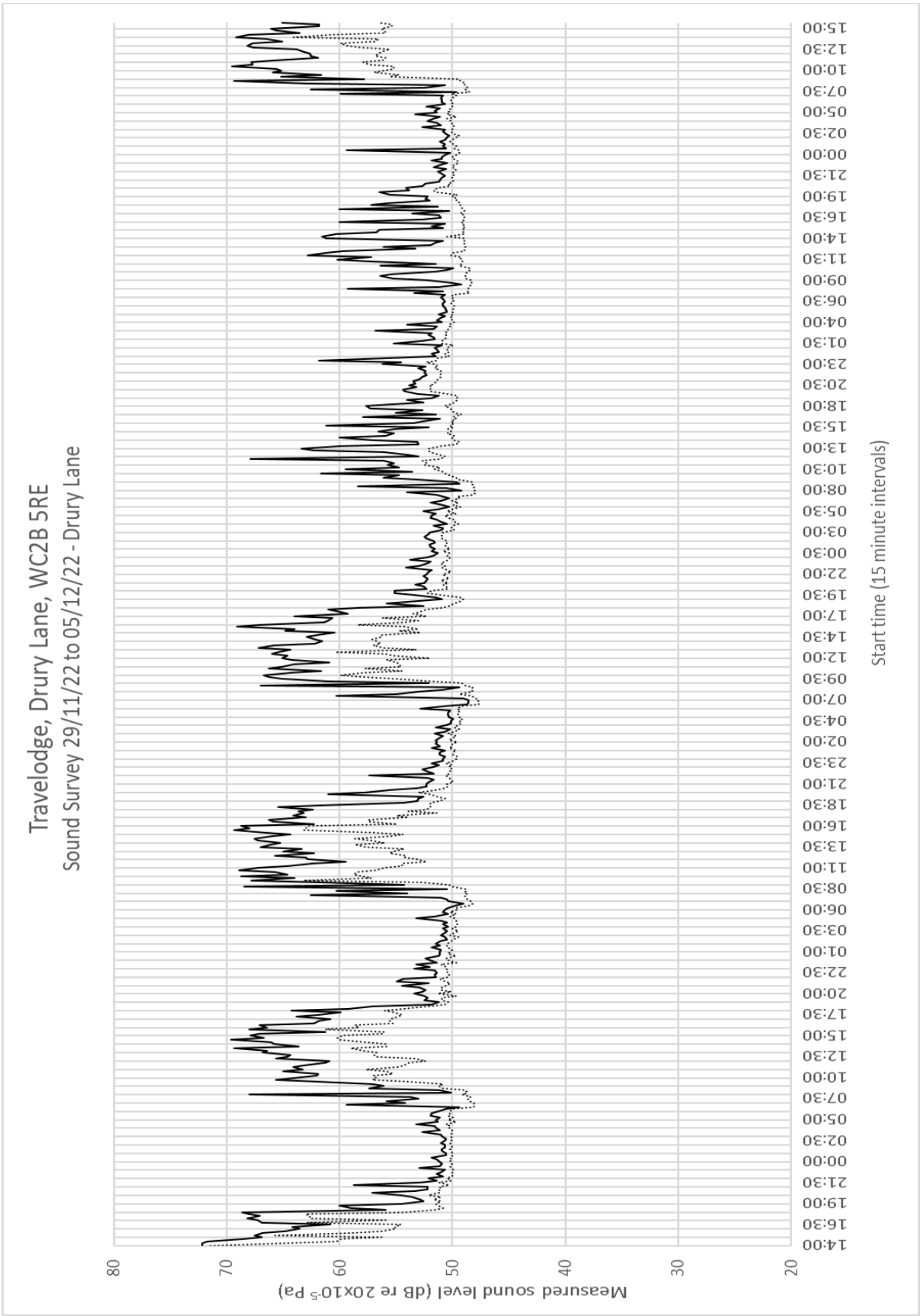
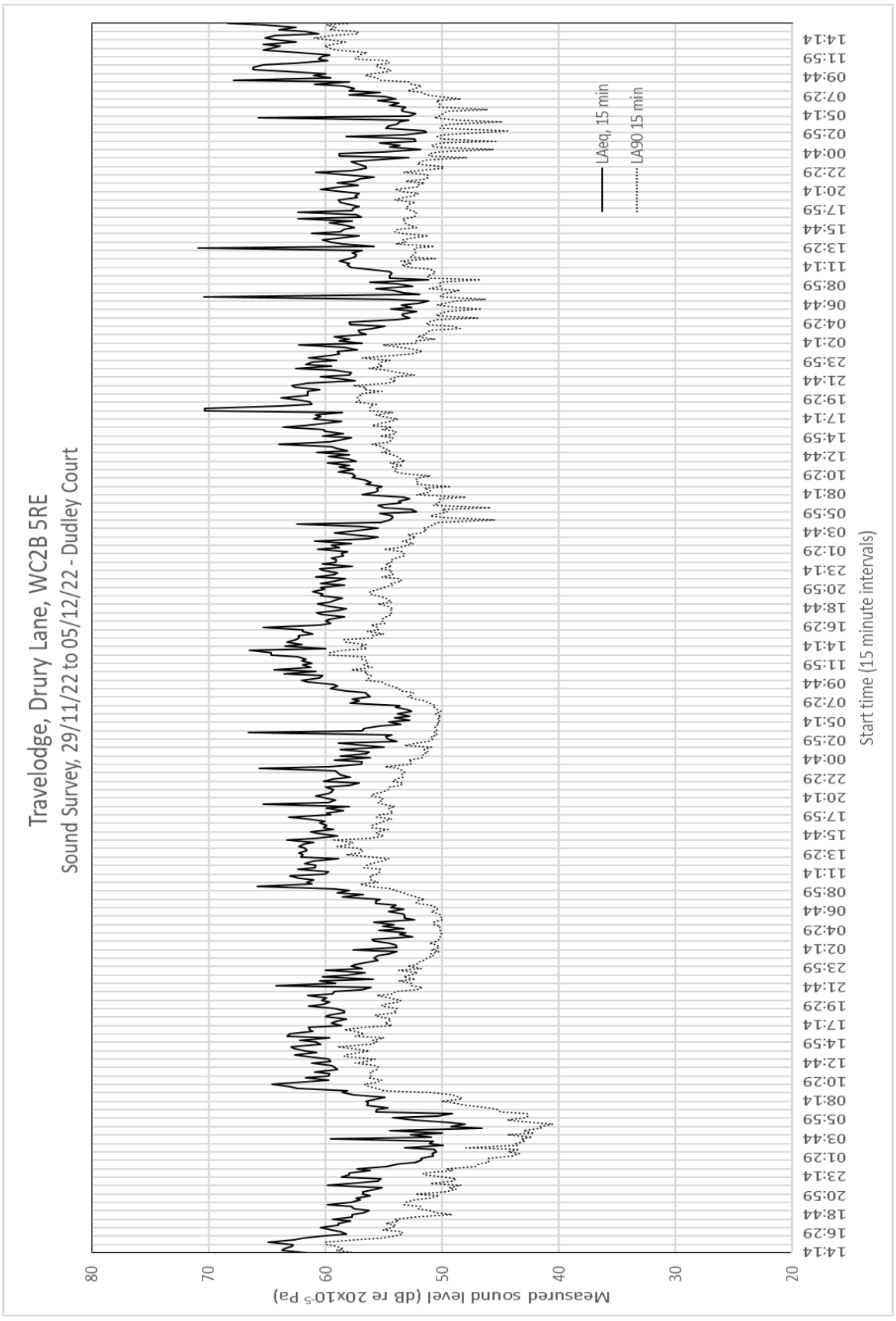


Image from Google Maps

Appendix 2: Sound Survey Results




Travelodge, Drury Lane, WC2B 5RE
Sound Survey, 29/11/22 to 05/12/22 - Dudley Court
LAeq, 15 min
LA90 15 min
Measured sound level (dB re 20x10-5 Pa)
80
70
60
50
40
30
20
Start time (15 minute intervals)
14:14
16:29
18:44
20:59
23:14
01:29
03:44
05:59
08:14
10:29
12:44
14:59
17:14
19:29
21:44
23:59
02:14
04:29
06:44
08:59
11:14
13:29
15:44
17:59
20:14
22:29
00:44
02:59
05:14
07:29
09:44
11:59
14:14

Appendix 3: Glossary of Terms.

Term	Description	Explanation
	Noise	Unwanted sound. In the explanation given below the words 'sound' and 'noise' can often be used interchangeably, depending on context.
dB	The decibel scale	The decibel (or dB) scale is the scale on which sound pressure levels are commonly measured. It is a logarithmic scale and is used for convenience to compress the audible range of sound pressures into a manageable range, from 0 dB to 140 dB. The zero of the scale, 0 dB, corresponds to the threshold of hearing, 0.00002 Pa, and the upper limit, 140 dB, corresponds to 20 Pa, the threshold of pain.
	Sound pressure	Sound is a disturbance or fluctuation in air pressure, and sound pressure, measured in pascals (Pa), is used as a measure of the magnitude of the sound. The human ear can detect sound pressures in the range from 0.00002 Pa to 20 Pa. This is an enormously wide range and so for convenience sound pressures are commonly measured on a decibel (dB) scale.
Lp	Sound pressure level	Instantaneous value of Sound Pressure Level (Lp).
	Sound power	The sound energy radiated per unit time by a sound source, measured in watts (W)
L_W	Sound power level	Sound power measured on a decibel scale: $L_W = 10\log(W/W_0)$, where W_0 is the reference value of sound power, 10^{-12} W.
f	Frequency	The frequency of a musical note is what gives it its pitch. It is the number of cycles of the fluctuating sound pressure which occur each second, and is measured in cycles per second, or Hertz (Hz). The human ear can detect frequencies in the range 20 to 20 000 Hz. Most sounds and noises are a mixture of all frequencies, called broad-band noise.
	Octave bands Octave band spectra	In order investigate the frequency content of broad band sounds, called its frequency spectrum, measurements of sound pressure are carried out over a range of frequency bands. The most common method is to split the audio frequency range into 8 or 9 octave bands. An octave is a frequency range from one particular frequency to double that frequency.
	Free-field	A free field sound level measurement is one which is unaffected by the presence of any sound reflecting surfaces. In an outdoor situation this is usually taken to mean with no sound reflecting surfaces within 3 m. of the source.
	Facade correction Factor	The difference between the façade level and the free field level (in the absence of the façade) is called the façade correction factor.
A	A-weighting	One of the three frequency weightings (A, C and Z) used in sound level meters, and defined in BS EN ISO 61672-1; a very widely used method of producing a single figure measure of a broad band noise which takes into account, in an approximate way at least, the frequency response of the human hearing system. The idea is that sound levels measured in this way should give an indication of the loudness of the sound.
Z	Z-weighting	One of the frequency weightings defined in BS EN ISO 61672-1; 'Z' stands for zero and the Z weighting correspond to a 0 dB weighting at all frequencies. Previously known as 'linear'.
f	Time weighting, fast	An averaging time used in sound level meters, and defined in BS EN ISO 61672-1.
s	Time weighting, slow	An averaging time used in sound level meters, and defined in BS EN ISO 61672-1.
L_A (dBA)	A- weighted sound pressure level	The value of the sound pressure level, in decibels, measured using an A-weighting electronic circuit built into the sound level meter. The vast majority of noise measurements are carried out in this way.
$L_{Aeq,T}$	Equivalent continuous sound level	It represents a measure of the 'average' sound level over the measurement period. It corresponds to the steady level of sound

Term	Description	Explanation
		which, over the same period of time, T, would contain the same amount of (A-weighted) sound energy as the time varying noise. Also known as the Average sound level. This is the most common method of measuring time varying noise, and within certain limits gives the best correlation with human response to noise, for example with annoyance.
$L_{AN,T}$	Statistical percentile noise levels	$L_{AN,T}$ is the noise level, usually A-weighted, which is exceeded for N% of the measurement period, T. The most commonly used values are $L_{A10,T}$ used for the measurement and assessment of traffic noise, and $L_{A90,T}$, commonly used as a measure of background noise. $L_{A1,T}$ and $L_{A99,T}$ are also occasionally used to give an indication of the highest and lowest noise levels occurring during the measurement time interval.
	Background noise	Ambient noise which remains at a given site when occasional and transient bursts of higher level ambient noise levels have subsided to typically low levels; it is the noise normally present for most of the time at a given site. It is usually described by the L_{A90} value.
$L_{A90,T}$	Background noise level	Defined in BS 4142 as the value of the A-weighted residual noise at the assessment position that is exceeded for 90 % of a given time interval, T, (i.e. $L_{A90,T)}$ measured using time weighting, F, and quoted to the nearest whole number of decibels. (Also see under residual noise). Background noise itself often varies with time and so the $L_{A90,T}$ is almost universally used as the best measure of the 'more or less always present' noise level which underlies short term variations from other sources of noise.
	Specific Noise Source	The noise source under consideration when assessing the likelihood of adverse impact using BS4142:2014.
	Specific Noise Level	The value of $L_{Aeq,T}$ at the assessment position produced by the specific noise source, ref. BS4142:2014.
$L_{ar,Tr}$	Rating Level	The specific noise level, corrected to account for any characteristic features of the noise, by adding a rating penalty for any tonal, impulsive or irregular qualities, ref. BS4142:2014.
T_r	Reference time interval	Specified interval over which the specific sound level is determined, ref. BS4142:2014.
	Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound, ref. BS4142:2014.
$L_r = L_{Aeq,T}$	Residual Sound Level	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T, ref. BS4142:2014.