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Briefing Note

One Bedford Avenue, London W1T 7RB

Discharge of Planning Condition 7 Ref.: 2014/6843/P

Date: 30 January 2017

Client Name: Exemplar Properties

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This document has been prepared and checked in accordance with Waterman Group's IMS (BS EN ISO 9001: 2008, BS EN ISO 14001: 2004 and BS OHSAS 18001:2007)

Issue	Prepared by	Checked & Approved by
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1. Introduction

1.1. On 20 December 2013 London Borough of Camden Council (LBCC) granted planning permission 2013/3880/P for a commercial-led scheme at 251-258 Tottenham Court Road and 1 Bedford Avenue, London W1T 7RB (hereafter 'the Development'). The permission was subject to a number of planning conditions with decision notice 2014/6843/P issued on 6 May 2015 providing variation on those conditions. Conditions 7 and 6 of decision notice 2014/6843/P concern noise.

1.2. Condition 7 states:

'Once the aggregated plant has been installed and fully commissioned a noise survey pursuant to BS4142 shall be carried out to verify compliance with condition 7. A noise report shall be produced containing all raw data and showing how calculations have been made including all corrections and assumptions made. A copy of such report shall be submitted to the Local Planning Authority for its approval in writing.'

1.3. Condition 6 states:

'Noise levels at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement (LA90), expressed in dB(A) when all plant (or any part of it) is in operation unless the plant hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 10dB(A) below the LA90, expressed in dB(A).'

1.4. This briefing note is submitted in fulfilment of Condition 7 of the planning consent (Ref.: 2014/6843/P) of LBCC. The acoustic terminology used in this briefing note are defined in **Annex 1**.

2. Plant Compliment

2.1. On Tuesday 17th January 2017 measurements of all noise generating plant with external louvres installed within the Development were taken at source with all plant running at maximum operational duty. The measurement data is presented in **Table 2.2**. All measurements were taken at a distance of 1 m from the operating plant unless otherwise stated.

Table 2.2: Schedule of Fixed External Building Services Plant

Plant Item	Sound Pressure Level (dB) in each Octave Band Centre Frequency (Hz)								L_p, dBA
	63	125	250	500	1k	2k	4k	8k	
8th Floor Plantroom – measurements were taken on the plant side of external louvres									
Life Safety Generator - Intake	86	71	67	58	53	51	48	51	64
Life Safety Generator - Exhaust	79	73	68	62	59	57	52	50	66
Life Safety Generator – North Side	71	74	74	66	65	64	60	56	71
Extract Fan (TF:02) - Exhaust	74	65	68	65	67	67	61	62	72
DX Heat Pump Unit	75	69	68	62	60	59	53	52	66
Extract Fan (TF:03&04) - Exhaust	67	68	65	59	58	55	51	64	67
General Plantroom Measurement[1]	72	64	61	53	54	50	44	56	60
7th Floor Plantroom – measurements were taken internally to the plantroom									
AHU - Intake	68	68	64	57	54	50	50	49	61
Extract Fan (TF:01) - Exhaust	74	75	70	69	72	68	62	59	75
Chiller - Coils	74	69	69	66	63	55	49	42	68
General Plantroom Measurement[1]	70	78	67	66	62	59	49	44	68
Basement Plantroom – measurements were taken internally to the plantroom									
Extract Louvre - Intake	63	64	73	66	66	64	63	53	72
Large Boiler Pumps	64	62	79	68	67	65	68	63	76
Small Boiler Pumps	64	68	72	68	68	65	71	63	75
Reverberant Level	63	64	73	66	67	65	67	58	73
General Plantroom Measurement[1]	62	64	71	68	68	67	67	58	74
Ground Level – measurements were taken externally on Morwell Street									
Bin Extract - Exhaust	64	61	63	68	57	57	54	47	67
Bin Extract - Façade	63	57	60	67	55	54	50	44	65

Notes: [1] General plantroom measurements were undertaken at 1.5 m above the floor surface and at a central position considered to be representative of the general noise climate within the room.

3. Noise Sensitive Receptors

3.1. Existing properties within the vicinity of the Development are mixed in nature, however, residential apartments have been identified in proximity to the Site. The closest noise sensitive receptor (NSR)

to the site is the Bedford Court Mansions residential apartments that have windows overlooking Morwell Street, 8 m to the east of the Development. This NSR is illustrated on **Figure 2**.

4. Baseline Noise Survey

4.1. In support of the planning application for the proposed Development, a comprehensive baseline environmental noise survey was undertaken at the Site in order to establish and quantify the existing noise climate.

4.2. Monitoring was carried out over a 2-day period from 16th January to 18th January 2013 at three key 5th floor roof level locations (LT1 and LT2) chosen to establish the prevailing noise climate on Site, whilst also provide a good representation of the noise environment experienced at adjacent potential NSRs.

4.3. The full results of the baseline environmental noise surveys are displayed graphically in time-history format in Annex 2, whilst a summary of the measured daytime (07:00 to 19:00 hour), evening (19:00 to 23:00 hour) and night-time (23:00 to 07:00 hour) noise levels for the survey period are tabulated below in **Table 4.1**.

Table 4.1: Baseline Noise Measurements

Monitoring Location (Figure 1)	Period	Duration	$L_{Aeq,T}$ dB[1]	$L_{A90,T}$	
				Range	Ave[2]
LT1	Day	12hr	69	59 – 70	62
	Evening	4hr	68	59 – 63	61
	Night	8hr	67	55 – 67	59
LT2	Day	12hr	69	57 – 83	60
	Evening	4hr	64	56 – 60	58
	Night	8hr	63	52 – 63	56
LT3	Day	12hr	58	53 – 56	56
	Evening	4hr	57	52 – 54	53
	Night	8hr	57	51 – 58	53

Notes: [1] Logarithmic average over the day/evening/night survey periods. [2] Arithmetic average over the day/evening/night survey periods. All figures rounded to nearest whole decibel.

5. Plant Noise Emission Limits

5.1. In setting the plant noise emission limits, regard has been given to the results of the baseline noise survey and the requirements of LBCC in Condition 6. Consequently, it is necessary that the 'rated' plant noise level is controlled to at least 5 dB below the external background noise level.

5.2. The average monitored background noise level has been used in this assessment and is presented in **Table 5.1** with the adopted limiting criteria.

Table 5.1: External Plant Noise Emission Limits at Closest NSRs

Location	Period	Average $L_{A90,5min}$ (dB)	Plant Noise Emission Limit [1] (dB $L_{Ar,5min}$)
All NSR's	Daytime	56	51
	Night-time	53	48

Notes: [1] If there is determined to be tonal or intermittent content emitting from plant then a 5 dB acoustic feature correction shall be applied (i.e. the plant noise limits shall be reduced by 5 dB).

6. Plant Noise Emission Assessment

6.1. On Tuesday 17th January 2017, whilst measurements of all noise generating plant within the Development were being undertaken at source (see **Section 2**), simultaneous measurements were undertaken at 1 m from the façade of the NSR with all Development related plant running at maximum operational duty. On completion of these measurements, the ambient noise level without any of the Development plant running was measured to enable the calculation of the specific noise level (total noise level minus ambient noise level).

6.2. It was noted by the surveyor that all plant associated with the Development, with the exception of the bin store extract fan, was considered to be inaudible at the NSR. The specific sound level at the NSR resulting from the 8th floor, 7th floor and basement plant could not be calculated as it was insignificant against the ambient noise level of the area. The specific sound level of the bin store extract fan situated at ground floor level was calculated by measuring at 1 m from the fan louvre whilst simultaneously measuring at 4 m and then extrapolating a factor of distance propagation to calculate the specific level at the NSR.

6.3. The specific plant noise levels at the NSR are shown below in **Table 6.1** with more detailed calculations shown in **Annex 3**.

Table 6.1: External Plant Noise Emission Levels at NSR – Current Situation

Plant	Plant Noise Emission Limit (dB $L_{Ar,5min}$)	Calculated Plant Rating Level (dB $L_{Ar,5min}$)
Cumulative Plant (excluding Bin Store Extract Fan)	48	Immeasurable and Inaudible
Current Bin Store Extract Fan		47
Total Cumulative Plant		**47**

6.4. From Table 6.1 it can be seen that the cumulative plant rating noise level is 1 dB below the plant noise emission limit at the NSR. The Development therefore currently meets the requirements of Condition 6 with no additional design measures required.

6.5. The current bin store extract fan is due to be removed and replaced by a fan that provides a higher duty. Because of this, supplier's data has been used to calculate the plant rating level that will occur when the new fan is in place and to confirm whether the new fan will still comply with Condition 6. These calculations are summarised in **Table 6.2** and shown in more detail in Annex 3.

Table 6.2: External Plant Noise Emission Levels at NSR – Likely Future Situation

Plant	Plant Noise Emission Limit (dB $L_{Ar,5min}$)	Calculated Plant Rating Level (dB $L_{Ar,5min}$)
Cumulative Plant (excluding Bin Store Extract Fan)	48	Immeasurable and Inaudible
Future Bin Store Extract Fan		47
Total Cumulative Plant		**47**

6.6. From Table 6.2 it can be seen that the cumulative plant rating noise level when the new extract fan is in place will still be 1 dB below the plant noise emission limit at the NSR. The Development therefore will meet the requirements of Condition 6 when the new extract fan is installed with no additional design measures required.

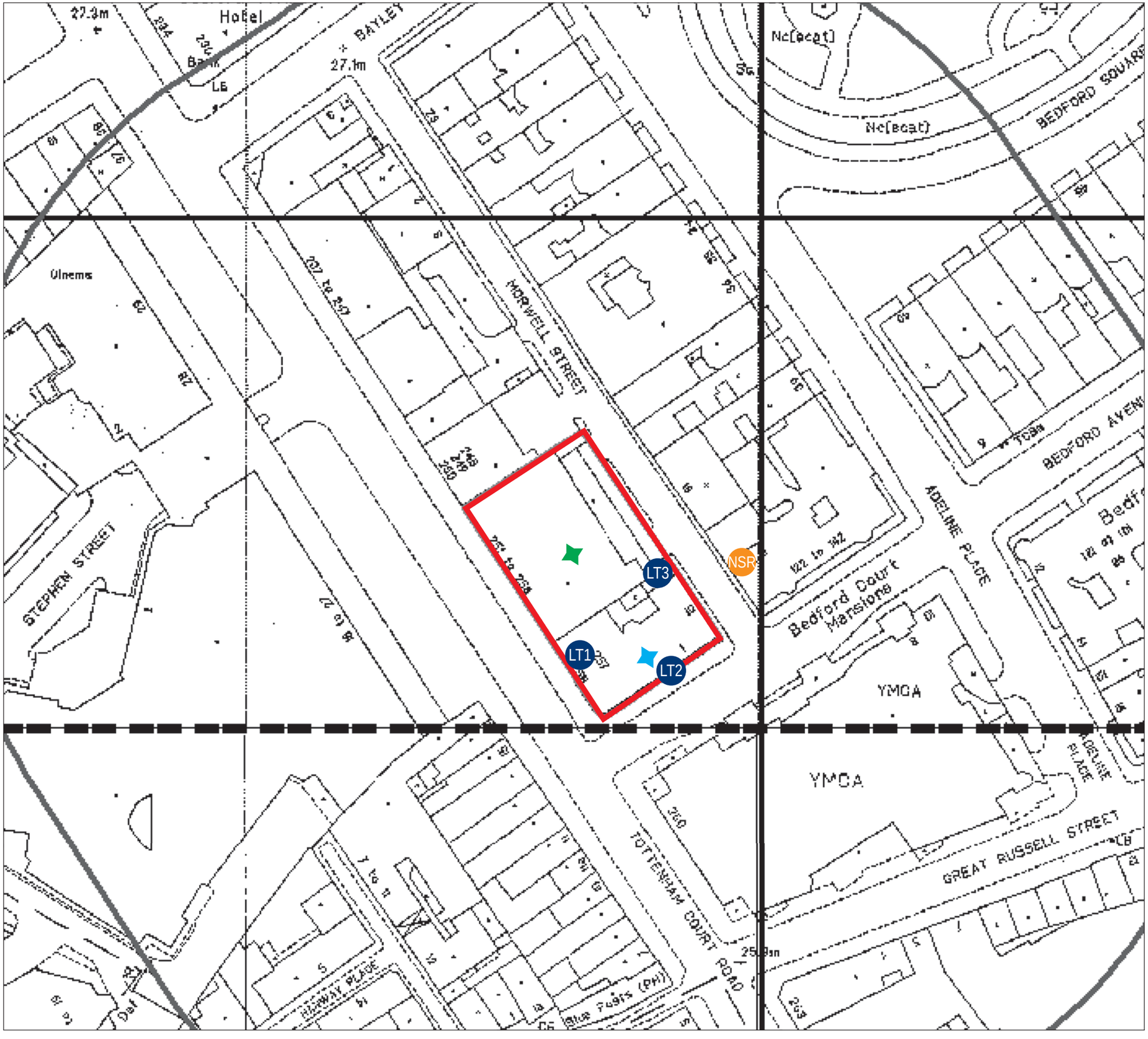
7. Conclusion

7.1. On 20 December 2013 London Borough of Camden Council (LBCC) granted planning permission 2013/3880/P for a commercial-led scheme at 251-258 Tottenham Court Road and 1 Bedford Avenue, London W1T 7RB. The permission was subject to a number of planning conditions with decision notice 2014/6843/P issued on 6 May 2015 providing variation on those conditions. This briefing note was prepared to fulfil Condition 7 of the LBCC planning consent, by showing that the Development complies with Condition 6 of the same planning consent, based on the following points:

- The compliment of plant which affects the consent of Condition 7 and measurements of all noise generating plant has been presented.
- Residential apartments overlooking Morwell Street at a distance of 8 m from the Development were identified as the critical NSR in the discharge of Condition 7.
- The methodology and results for the baseline noise survey carried out in January 2013 have been used in the assessment and the setting of suitable plant noise emission limits in accordance with LBCC's plant noise policy to which all fixed plant has been designed to achieve.
- As required in Condition 6, and therefore also Condition 7, noise from the operation of plant associated with the Development has been assessed to be more than 5 dB below the measured background noise level at the nearest sensitive receptor. Whilst the bin store extract fan at ground floor level is due to be replaced with a different model, the new fan has been assessed and is also expected to be in compliance with Condition 6.

7.2. It is concluded that the Development is in compliance with the requirements of Condition 6, and therefore Condition 7, and that no additional design measures will be needed.

Figures



Site Boundary

Monitoring Locations

Noise Sensitive Receptors

Location of 7th Floor 4m, Four Sided Plant Enclosure

Location of Rooftop (Level 8) 1.8m, Four Sided Plant Enclosure

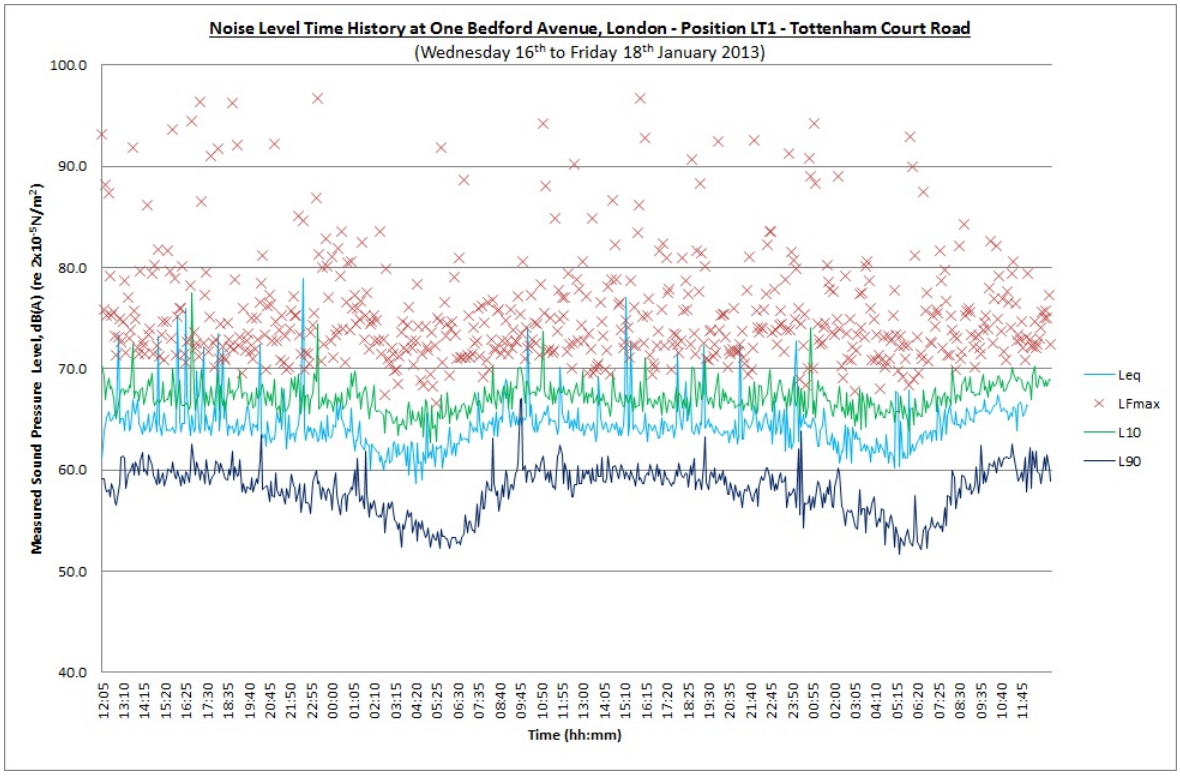
Project Details	WIB13325-100: One Bedford Avenue
Figure Title	Figure 1: Noise Monitoring Locations and Sensitive Receptor Location Plan
Figure Ref	WIB13325-100_GR_SR_1A
Date	January 2017
File Location	\\nt-lncs\weedl\projects\eed13325\100\graphics\sr\issued figures

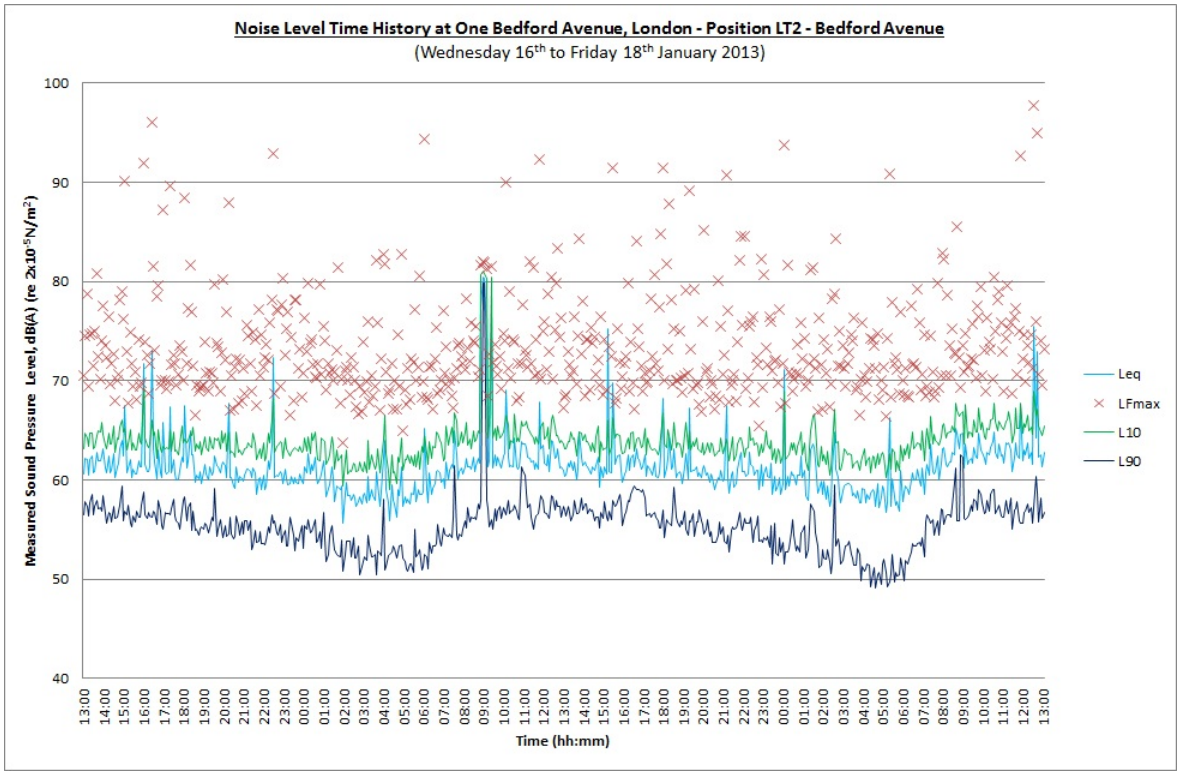
Annex 1: Acoustic Terminology

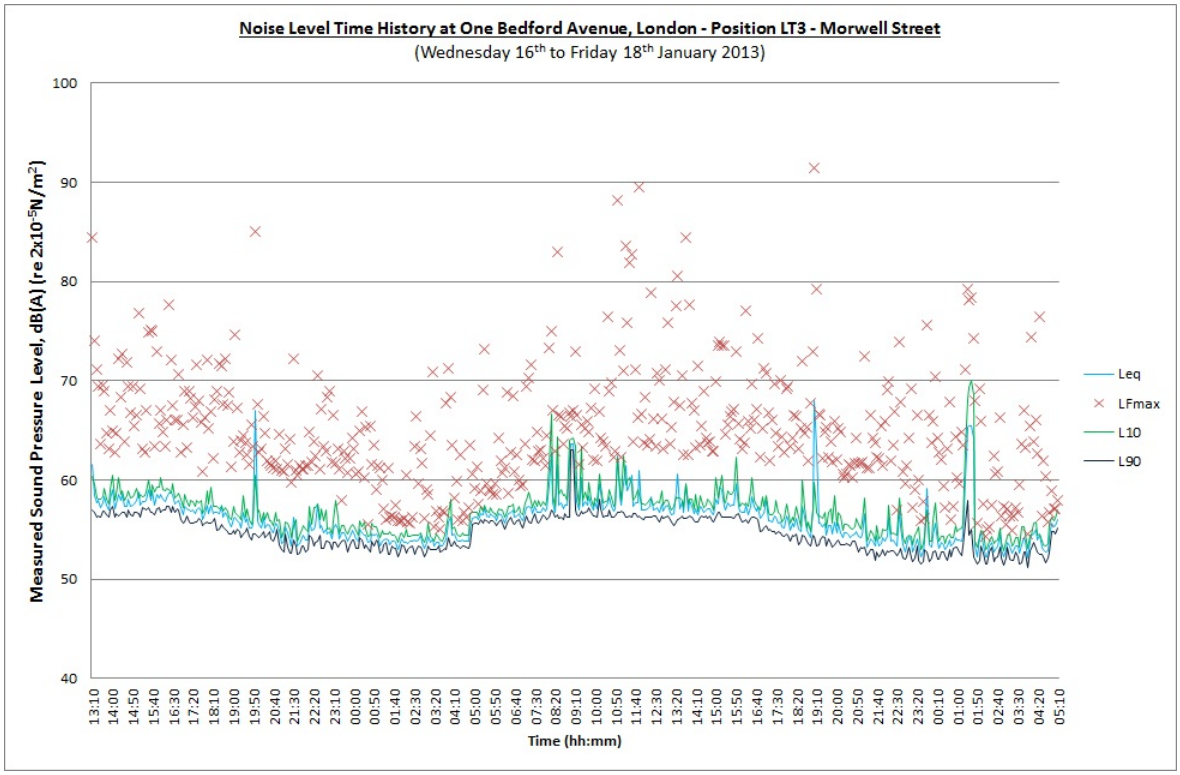
Ambient sound	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
A-weighting	A frequency weighting applied to measured or predicted sounds levels in order to compensate for the non-linearity of human hearing.
Background noise	Background noise is the term used to describe the noise measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L_{90} noise level (see below).
Broadband	Containing the full range of frequencies.
Decibel [dB]	The level of noise is measured objectively using a Sound Level Meter. This instrument has been specifically developed to mimic the operation of the human ear. The human ear responds to minute pressure variations in the air. These pressure variations can be likened to the ripples on the surface of water but of course cannot be seen. The pressure variations in the air cause the eardrum to vibrate and this is heard as sound in the brain. The stronger the pressure variations, the louder the sound is heard. The range of pressure variations associated with everyday living may span over a range of a million to one. On the top range may be the sound of a jet engine and on the bottom of the range may be the sound of a pin dropping. Instead of expressing pressure in units ranging from a million to one, it is found convenient to condense this range to a scale 0 to 120 and give it the units of decibels. The following are examples of the decibel readings of every day sounds; Four engine jet aircraft at 100m — 120 dB Riveting of steel plate at 10m — 105 dB Pneumatic drill at 10m — 90 dB Circular wood saw at 10m — 80 dB Heavy road traffic at 10m — 75 dB Telephone bell at 10m — 65 dB Male speech, average at 10m — 50 dB Whisper at 10m — 25 dB Threshold of hearing, 1,000 Hz — 0 dB
Free Field	Free field noise levels are measured or predicted such that there is no contribution made up of reflections from sound reflecting objects (e.g. buildings),usually taken to mean at least 3.5m away.
dB(A): A-weighted decibels	The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the 'A' filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise

	is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.
Façade Noise Level	A noise level measured or predicted at the façade of a building, typically at a distance of 1m, containing a contribution made up of reflections from the façade itself (+3 dB).
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
L_{eq}	A noise level index called the equivalent continuous noise level over a specified period of time, 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_{90}	The level of noise exceeded for 90% of the measurement time interval, T. The L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
L_{max}	The maximum noise level over a specified period of time, T, and unless described otherwise, it is measured using the 'fast' sound level meter response. The L_{AFmax} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{Aeq} noise level but will still affect the noise environment.
Rating Noise Level ($L_{Ar,Tr}$)	The equivalent continuous A-weighted sound pressure level during a specified time interval, plus specified adjustments for tonal character and impulsiveness of sound.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on. That is, the sound of 85 dB is 400% times the loudness of a sound of 65 dB.
Noise	Sound which a listener does not wish to hear.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Specific Noise Level	The monitored/calculated noise level as a result of a noise source excluding the impacts of any extraneous noise sources.
Weighted Sound Reduction Index (R_w)	The weighted sound reduction index (R_W) is a single figure number rating used to describe the sound reduction of a material or building element. The R_W is calculated from the measured values in each one-third-octave band. A laboratory measurement and so may be used to compare building elements. As with all single figure indices the specified acoustic performance is not always achieved when applied to real noise exposure. Consequently, the R_w cannot be used directly to estimate the noise level in the room. However, where noise from road traffic, low speed railway traffic and/or aircraft traffic at large distances exists, the spectrum adaptation term, C_{tr}, can be added to the R_w to take account of the low frequency spectrum of the noise and provide a more accurate indication of the sound reduction of the building element (e.g. window) (in dB).

Annex 2: Noise Monitoring Results




Noise Level Time History at One Bedford Avenue, London - Position LT2 - Bedford Avenue
(Wednesday 16th to Friday 18th January 2013)
Measured Sound Pressure Level, dB(A) (re 2x10-5N/m2)
Time (hh:mm)
Leq
LFmax
L10
L90


Noise Level Time History at One Bedford Avenue, London - Position LT3 - Morwell Street
(Wednesday 16th to Friday 18th January 2013)
Measured Sound Pressure Level, dB(A) (re 2x10-5N/m2)
Time (hh:mm)
Leq
LFmax
L10
L90

Annex 3: Plant Rating Level Calculations

Table A3.1: Current Bin Store Extract Fan Calculation of Plant Noise Rating Level at the NSR

Parameter	Broadband	Octave Band Centre Frequency							
		63 Hz	125 Hz	250 Hz	500 Hz	1.0 kHz	2.0 kHz	4.0 kHz	8.0 kHz
Measured Data									
A) L_p at 1 m from Development façade (dB)	65	63	57	60	67	55	54	50	44
A) L_p at 4 m from Development façade (dB)	57	61	58	55	57	51	47	42	33
B) Ambient Noise Level (L_{eq} dB)	54	62	56	53	51	50	46	40	30
Specific Level (A-B)									
L_{rTr} at 1 m from Development façade (dB)[1]	62	53	48	56	64	50	50	47	41
L_{rTr} at 4 m from Development façade (dB)	54	45	51	52	56	43	39	39	31
Function of Propagation[2]	12	12	10	7	13	12	18	14	16
L_{rTr} at 1 m from the NSR façade[1+3] (dB)	47	38	37	49	48	37	28	30	21

Notes: [1] 3 dB façade correction applied. [2] Function of propagation calculated from the differential between the measurement at 1 m and at 4 m. [3] NSR noise level calculated at a distance of 26 m from the extract fan exhaust louvre.

Table A3.2: Future Bin Store Extract Fan Calculation of Plant Noise Rating Level at the NSR

Parameter	Broadband	Octave Band Centre Frequency							
		63 Hz	125 Hz	250 Hz	500 Hz	1.0 kHz	2.0 kHz	4.0 kHz	8.0 kHz
Exhaust - L_w (dB)	83	80	87	80	83	79	70	63	55
Attenuator Insertion Loss (dB)	-	3	7	13	26	37	30	26	16
Function of Propagation[1]	12	12	10	7	13	12	18	14	16
L_{rTr} at 1 m from NSR (dB)[2,3+4]	47	54	61	52	34	20	10	12	11

Notes: [1] Function of propagation taken to be the same as for the current fan, see Table A3.1. [2] NSR noise level calculated at a distance of 26 m from the extract fan exhaust louvre. [3] 3 dB façade correction applied. [4] Directivity factor of 4.