Acoustic Consultancy Report

66746/3/1/5

External Plant Assessment Issue 2

Report Prepared For

Dtz Investment Management
44-46 Whitfield Street
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Contents

i) Executive Summary

New mechanical plant is to be installed at 44-46 Whitfield Street, in London.

LCP has been commissioned by DTZ Investment Management to carry out a background noise survey and to use the obtained data to assess the noise impact of the plant installation on surrounding noise sensitive receptors.

The design criterion is as follows:

Day:	43 dB $L_{Aeq,\,T}$ at 21m, Neighbouring premises north west to site;
Evening:	42 dB $L_{Aeq,\,T}$ at 21m, Neighbouring premises north west to site;
Night:	41 dB $L_{Aeq,\,T}$ at 21m, Neighbouring premises north west to site.

The design as proposed and assessed will achieve the required criteria; the emissions have been calculated as follows:

41 dB $L_{Aeq,\,T}$ at 21m, Neighbouring premises north west to site.

The calculations show that noise from the proposed plant will meet London Borough of Camden Development Policy DP28.

ii) Document History

Issue	Date	Issue Details	Issued By	Checked By
1	28/04/2014	Initial Issue	JN	MB
2	06/05/2014	Minor changes	JN	MB

1 Introduction

New mechanical plant is to be installed at 44-46 Whitfield Street, in London.

LCP has been commissioned by DTZ Investment Management to carry out a background noise survey and to use the obtained data to assess the noise impact of the plant installation on surrounding noise sensitive receptors.

2 Survey

2.1 Site Description

The site layout together with the measurement position is shown in the drawing contained within Appendix A.

Photographs are shown in Appendix B.

2.2 Receiver Location

The site was surveyed to determine the location of the most affected receiver.

The nearest receiver with direct line of sight to the plant area is 21m to the North West of the site. This is shown in both the site plan in Appendix A and the photograph 'looking North West' in Appendix B.

2.3 Local Noise Climate

The predominant local noise sources were road traffic and existing plant noise.

2.4 Measurements

The noise monitoring took place from the 22/04/2014 to the 23/04/2014. The measurement period was considered sufficient to establish the lowest background noise levels corresponding to the operational period of the plant.

The weather conditions during the survey were predominantly calm and dry.

2.5 Measurement Results

The measured statistical broad-band sound pressure levels are shown within Appendix C. The lowest representative background noise level(s) obtained being as follows:

Table 1: Lowest measured background noise levels, dB re $2x10^{-5}$ Pa

Measurement Position	$L_{A90, 5 mins}$ Day*	$L_{A90, 5 mins}$ Evening*	$L_{A90, 5 mins}$ Night*
MP1	53	52	51

* Day, Evening and Night periods are defined as between 07:00 - 19.00, 19.00 - 23.00 and 23:00 - 07:00 respectively.

3 Evaluation of Design Criteria

3.1 Local Authority Requirements

The London Borough of Camden Development Policy DP28 provides the noise criteria shown in the following table in relation to noise from plant and machinery.

Table 2: Design rating levels, dB re $2x10^{-5}$ Pa

Noise description and location of measurement	Period	Time	Noise Level
Noise at 1m external to a sensitive façade.	Day, evening and night	00:00-24:00	5dB(A)<LA90
Noise that has a distinguishable discrete continuous note at 1m external to a sensitive façade.	Day, evening and night	00:00-24:00	10dB(A)<LA90
Noise that has distinct impulses at 1m external to a sensitive façade	Day, evening and night	00:00-24:00	10dB(A)<LA90
Noise at 1m external to a sensitive façade where LA90>60dB	Day, evening and night	00:00-24:00	55dBL_{Aeq}

3.2 Design Rating Level

On the basis of the above the design levels to be adopted for this project are set out in the table below.

Table 3: Design rating levels, dB re $2x10^{-5}$ Pa

Receiver Premises	Approximate Distance (m)	Design Level (Day) $L_{Aeq, 12 hr}$	Design Level (Evening) $L_{Aeq, 4 hr}$	Design Level (Night) $L_{Aeq, 8 hr}$
Neighbouring premises north west to site	21	43	42	41

4 Review of Current Design

4.1 Current Design

The proposed plant shall be located at 5th Floor level, behind a louvred screen; it is assumed that this is a standard weather louvre and it is assumed that the minimum height of the screen will match the height of the proposed units. Plant includes four Mitsubishi PURY-P400YJM-A units, one Mitsubishi PURY-P450YJM-A unit and two heat pumps.

4.2 Calculated Results

Calculations of the predicted noise levels have been carried out with the appropriate corrections for geometric attenuation, barrier effect, reflective surfaces and multiple source addition.

The design rating levels to be adopted for this project, together with the predicted noise levels, are set out in the following below.

Table 4: Predicted and design noise levels, dB re $2x10^{-5}$ Pa

Receiver Premises	Approximate Distance (m)	Design Level (Day) $L_{Aeq,\ 12\ hr}$	Design Level (Evening) $L_{Aeq,\ 4\ hr}$	Design Level (Night) $L_{Aeq,\ 8\ hr}$	Predicted Level $L_{Aeq,T}$
Neighbouring premises north west to site	21	43	42	41	41

Plant noise level data used in this assessment are contained within Appendix D. Calculations are shown within Appendix E.

5 Conclusion

An environmental noise survey has been undertaken in order to establish the existing background noise levels local to the site generally in accordance with the method contained within BS4142: 1997.

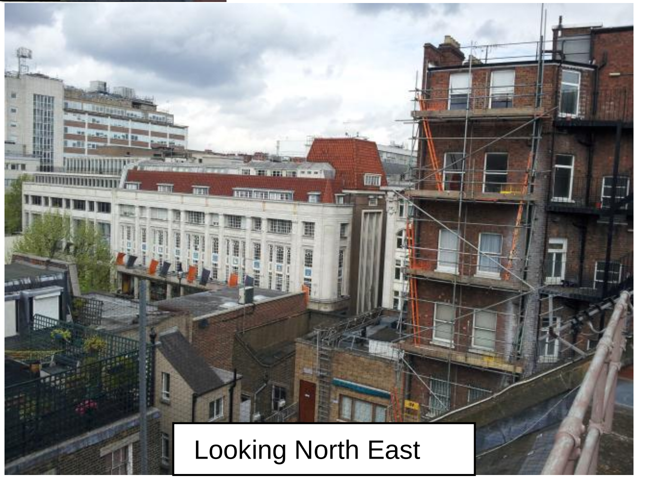
Calculations have been carried out to determine the noise levels at the nearest receiver premises. The calculations show that noise from the proposed plant will meet London Borough of Camden Development Policy DP28.

Appendix A: Site Plan

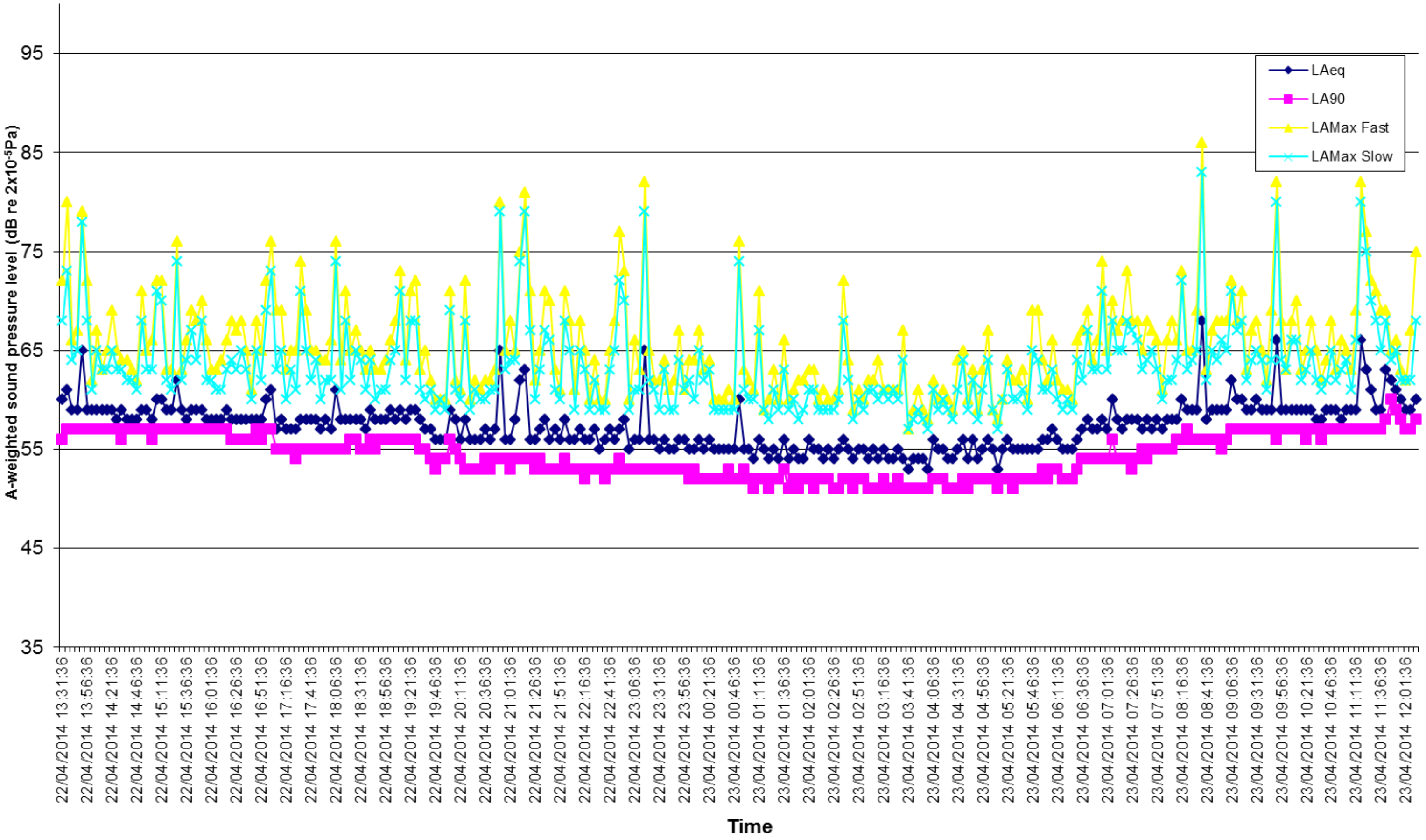
Appendix B: Photographs


Looking South West


Looking North West


Looking North East

Appendix C: Measurement Data



Sound pressure level measurements were obtained using the following instrumentation complying with the Class 1 specification of BS EN 61672:2003

- Svantek 959 Sound Level Meter S/N: 11205
- Svantek pre-amplifier SV12L S/N: 13245 with GRAS microphone capsule 40AE S/N: 75181

Calibration checks were made prior to and after completion of measurements using a Svantek SV30A calibrator, S/N: 10890 complying with Class 1 specification of BS EN 60942:2003, calibration level 94.0 dB @ 1.0 kHz. All acoustic instrumentation carried current manufacturer's certificates of conformance.

Appendix D: Plant Data

Table 5: Manufacturer's plant sound pressure data, dB re $2x10^{-5}$ Pa

Plant	Distance (m)	Octave Band Centre Frequency (Hz)								L_{PA}
		63	125	250	500	1k	2k	4k	8k	
PURY-P400YJM-A	1	73	66	63	58	55	51	48	41	61
PURY-P450YJM-A	1	66	66	66	59	55	51	48	40	62
Heat Pump*	1	40	41	43	43	46	43	39	33	50

*Spectral noise data has been assumed from manufacturers single figure data.

Appendix E: Calculations

Ref.	plant	Ref.dist.	Sound Level (Lp/Lw) 63	125	250	500	1k	2k	4k	8k	dB(A)	Lw dB(A)	Reciever Distance (m)	dB(A)	Lp	No. off	dB	Angular Directionality	63	125	250	500	1k	2k	4k	8k	Façade correction	dB
1	4 x PURY-P400YJM-A	1.00	73	66	63	58	55	51	48	41	61	69	21.0	-34	35	4	6	None	0	0	0	0	0	0	0	0	Yes	3
2	1 x PURY-P450YJM-A	1.00	66	66	66	59	55	51	48	40	62	70	21.0	-34	36	1	0	None	0	0	0	0	0	0	0	0	Yes	3
3	2 x Heat Pump	1.00	40	41	43	43	46	43	39	33	50	58	21.0	-34	23	2	3	None	0	0	0	0	0	0	0	0	Yes	3

Ref.	plant	Receiver Lp 63	125	250	500	1k	2k	4k	8k	dB(A)
1	4 x PURY-P400YJM-A	56	49	46	41	38	34	31	24	44
2	1 x PURY-P450YJM-A	43	43	43	36	32	28	25	17	39
3	2 x Heat Pump	20	21	23	23	26	23	19	13	29
	Total	**58**	**52**	**49**	**44**	**41**	**37**	**34**	**27**	**47**

Barrier Path Difference Loss:

Source height	Receiver height	Barrier height	Source to barrier distance	Barrier to receiver distance	Calculated path difference	63	125	250	500	1000	2000	4000	8000
1.7	0.0	1.7	2.0	19.0	0.01	-5	-5	-5	-5	-6	-7	-8	-10
1.7	0.0	1.7	2.0	19.0	0.01	-5	-5	-5	-5	-6	-7	-8	-10
1.0	0.0	1.7	2.0	19.0	0.17	-6	-7	-9	-11	-14	-16	-19	-22

Criteria NR	63	125	250	500	1k	2k	4k	8k	dB(A)
33	62	51	43	37	33	30	28	26	42

Barrier SRI	63	125	250	500	1k	2k	4k	8k
Manual	1	2	2	2	3	3	4	7
Unknown	100	100	100	100	100	100	100	100

Ref.	Plant	Excess 63	125	250	500	1k	2k	4k	8k	dB(A)
1	4 x PURY-P400YJM-A	-6	-2	3	4	5	4	3	-2	2
2	1 x PURY-P450YJM-A	-19	-8	0	-1	-1	-2	-3	-9	-3
3	2 x Heat Pump	-42	-30	-20	-14	-7	-7	-9	-13	-13
	Total	-4	1	7	7	8	7	6	1	5

Barrier Deration								
4 x PURY-P400YJM-A	0	0	0	0	0	0	0	0
1 x PURY-P450YJM-A	0	0	0	0	0	0	0	0
2 x Heat Pump	0	0	0	0	0	0	0	0

Ref.	Plant	Mitigated Receiver Lp 63	125	250	500	1k	2k	4k	8k	dB(A)
1	4 x PURY-P400YJM-A	51	44	41	35	32	27	23	14	38
2	1 x PURY-P450YJM-A	38	38	37	30	26	21	17	7	33
3	2 x Heat Pump	13	13	14	11	12	6	-1	-10	15
	Total	**53**	**47**	**44**	**38**	**35**	**30**	**26**	**16**	**41**

Net barrier loss								
4 x PURY-P400YJM-A	**-5**	**-5**	**-5**	**-5**	**-6**	**-7**	**-8**	**-10**
1 x PURY-P450YJM-A	**-5**	**-5**	**-5**	**-5**	**-6**	**-7**	**-8**	**-10**
2 x Heat Pump	**-6**	**-7**	**-9**	**-11**	**-14**	**-16**	**-19**	**-22**

Appendix F: Glossary

The list below details the major acoustical terms and descriptors, with brief definitions:

'A' Weighting

Weighting applied to the level in each stated octave band by a specified amount, in order to better represent the response of the human ear. The letter 'A' will follow a descriptor, indicating the value has been 'A' weighted. An 'A' weighted noise level may also be written as dB(A).

Airborne Noise

Noise transmitted through air.

Ambient Noise

The total noise level including all 'normally experienced' noise sources.

dB or Decibel

Literally meaning 'a tenth of a bel', the bel being a unit devised by the Bell Laboratory and named after Alexander Graham Bell. A logarithmically based descriptor to compare a level to a reference level. Decibel arithmetic is not linear, due to the logarithmic base. For example:

30 dB + 30 dB ≠ 60 dB	30 dB + 30 dB = 33 dB

D_{nTw}+C_{tr}

The weighted, normalised difference in airborne noise levels measured in a source room (L1) and a receive room (L2) due to a separating partition.

D	Is simply L1 – L2.
D_{nT}	Is the normalisation of the measured level difference to the expected (in comparison to the measured) reverberation time in the receiving room.
D_{nTw}	Is the weighted and normalised level difference. This value is the result of applying a known octave band weighting curve to the measured result.
C_{tr}	Is a correction factor applied to the D_{nTw} to account for the known effects of particular types of noise, such as loud stereo music or traffic noise.

Frequency (Hz)

Measured in Hertz (after Heinrich Hertz), and represents the number of cycles per second of a sound or tone.

Insertion Loss, dB

The amount of sound reduction offered by an attenuator or louvre once placed in the path of a noise level.

$L_{A90, T}$

The 'A' weighted noise level exceeded for 90% of the time period T, described or measured. The '90' can be substituted for any value between 1 and 99 to indicate the noise level exceeded for the corresponding percentage of time described or measured.

$L_{Aeq, T}$

The 'A' weighted 'equivalent' noise level, or the average noise level over the time period T, described or measured.

L_{Amax}

The 'A' weighted maximum measured noise level. Can be measured with a 'slow' (1 sec) or 'fast' (0.125 sec) time weighting.

L_{Amin}

The 'A' weighted minimum measured noise level.

NR

Noise Rating (NR) level. A frequency dependent system of noise level curves developed by the International Organisation for Standardisation (ISO). NR is used to categorise and determine the acceptable indoor environment in terms of hearing preservation, speech communication and annoyance in any given application as a single figure level. The US predominantly uses the Noise Criterion (NC) system.

Octave

The interval between a frequency in Hz (f) and either half or double that frequency (0.5f or 2f).

Pa

Pascals, the SI unit to describe pressure, after physicist Blaise Pascal.

Reverberation Time, T_{mf}, RT60, RT30 or RT20

The time taken in seconds for a sound to diminish within a room by 1,000 times its original level, corresponding to a drop in sound pressure of 60 dB. When taking field measurements and where background noise levels are high, the units RT20 or RT30 are used (measuring drops of 20 or 30 dB respectively). Sometimes given as a mid-frequency reverberation time, T_{mf} which is the average of reverberation time values at 500Hz, 1kHz and 2kHz.

R_w

The sound reduction value(s) of a constructional element such as a door, as measured in a laboratory, with a known octave band weighting curve applied to the result.

Sound Power Level

A noise level obtained by calculation from measurement data, given at the face of an item of plant or machinery. Referenced to 10^{-12} W or 1pW.

Sound Pressure Level

A noise level measured or given at a distance from a source or a number of sources. Referenced to $2x10^{-5}$ Pa.

Subjective Effect of Changes in Sound Pressure Level

The table below details the subjective effects of variations in sound pressures (adapted from Bies and Hansen).

Difference between background noise and rating levels	Increase in ambient noise level in 'real terms'	Change in apparent loudness
+ 10 dB	+ 10 dB	Twice as loud
+ 5 dB	+ 6 dB	Clearly noticeable
0 dB	+ 3 dB	Just perceptible
-10 dB	0 dB	No change

W

Watts, the SI unit to describe power, after engineer James Watt.