LK/NC/6656

9th April, 2010

ACOUSTIC CONSULTANTS

BARCLAYS BANK, WEST HAMPSTEAD
NOISE ASSESSMENT

architectural

environmental

occupational

industrial

noise control at source

project management

planning

legal services

expert witness

Report Prepared For:-

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CONTENTS

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1.0 SUMMARY

At the request of Kilby & Gayford Ltd. a noise survey has been conducted in the vicinity of the Barclays Bank at 208 West End Lane in West Hampstead. The survey has been used to assess the background noise at the nearest residential location.

The likely worst case noise of the proposed air-conditioning unit was modelled and the specific noise due to the activity was predicted at the façade of the nearest noise sensitive residence. All measurements and assessments have been conducted in accordance with the requirements contained within BS4142:1997 – 'Method for rating industrial noise affecting mixed residential and industrial areas'. It should be noted that only a daytime assessment was required as the bank only operates during normal office hours.

Our assessment in accordance with BS4142 indicates that the rating noise level of the development will be at least 6 dB below the minimum existing background level at the nearest sensitive façade, and gives an indication of marginal significance when assessed in accordance with BS4142. This also meets the requirements of the Camden Replacement Unitary Development Plan – Appendix 1 Noise and Vibration Thresholds, which states that noise levels from plant and machinery should be at least 5dB(A) below the existing background level at 1m external to a sensitive façade.

Report Prepared By:

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L Kavaney
Senior Acoustic Technician

Report Approved By:

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M de Salis
Principal Consultant

2.0 BRIEF FOR CONSULTANCY

PDA Ltd. was engaged to carry out the following:

A) We will travel to site and undertake an environmental noise survey to establish the existing external ambient noise around the bank vicinity. The surveys will likely be undertaken over the majority of the banking day including for morning tempering on a single week day to represent the quietest times that the condensers will be operating. It is noted that these background noise measurements will likely include operating noise of existing condensers. The measurements we will make will include both dB(A) and octave bands in terms of the L_{max}, L_{eq}, L_{10}, L_{50} and L_{90} parameters.

B) Based on the proposed layout of the condenser unit, and sound power information supplied by yourselves, we will determine expected noise levels due to condenser operation at local noise sensitive receivers. We will compare these predicted noise levels from the proposed condenser plant with the guidelines in BS4142:1997 Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas, and/or Local Authority requirements as applicable. Where exceedances of standard guidelines and/or existing noise levels are predicted then we will outline generic requirements for mitigation measures if required.

C) We will provide a full report detailing measurements, analysis and recommendations for input into the design.

3.0 SURVEY DETAILS

3.1 Site Description

The site is located at the side of the existing Barclays branch, 208 West End Lane, West Hampstead, London NW6 1UV.

The location of the proposed air-conditioning unit is at basement level at the side of the existing Barclays branch.

3.2 Survey Times and Personnel

The survey was conducted on the 23rd March 2010. All measurements were attended and made by Mr. Liam Kavaney of PDA Ltd.

3.3 Equipment

The survey was conducted with a CEL Instruments 593 C100 sound level meter. The CEL 593 sound level meter is a type 1 (as per BS EN 60651: 1994 and IEC 651) computing sound level meter capable of operating as an integrating sound level meter in compliance with BS EN 60204:1994 (IEC 804).

The sound level meter was mounted on a tripod approximately 1.5 metres above ground level and at least 3.5 metres from any reflecting surfaces, throughout the survey.

The sound level meter was field calibrated both before and after each measurement period, during which time no significant deviation from the calibrated level was observed. The sound level meter was fitted with a microphone windshield at all times.

3.4 Weather

During the survey there was some drizzle, cloud cover was 100%, the temperature ranged between 2 and 4°C, and wind speeds varied between 0.8 and 1.2m/s.

3.5 Measurement Positions & Procedure

Measurements were made at one position. The location was at the side of the proposed development adjacent to the nearest residences. The locations are shown in Figure 1.

The sound level meter was set up to measure dB(A) and octave bands in terms of L_{eq} and L_{90} values using a fast time weighting. Measurements were conducted between 0800 and 1800 to encompass the likely quietest part of the operating hours of the development and were set to 15-minute intervals with measurements being conducted consecutively. It is understood that the bank is only open during normal office hours up to a latest time of 5pm.

4.0 NOISE ASSESSMENT CRITERIA

4.1 BS4142:1997

The effect of noise on the nearest noise sensitive residence will be assessed in accordance with BS4142:1997 – 'Method for rating industrial noise affecting mixed residential and industrial areas'.

This standard describes a method of determining the level of a noise, together with procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity. It should be noted that although the proposed development is not strictly an industrial noise source, BS4142 gives an effective method for determining whether complaints are likely from any new noise source.

Briefly the standard may be thought of as a procedure for comparing the noise from industrial sources with background noise levels in the absence of the industrial noise and determining the likelihood of complaints.

In accordance with BS 4142 the background noise level is the A-weighted sound pressure level at the assessment position that is exceeded for 90% of a given time interval (L_{A90}). The specific noise level is the equivalent continuous (L_{Aeq}) sound pressure level at the assessment position produced by the noise source over a given time interval.

Certain acoustic features can increase the likelihood of complaint over that expected from a simple comparison between the specific noise level and the background level. Where such features are present, these are taken into account by adding 5 dB to the specific noise level this is called the rating level.

This 5 dB correction should be applied if one or more of the following features occur, or are expected to be present.

- The noise contains a distinguishable, discrete, continuous tone (whine, hiss, screech, hum, etc.).
- The noise contains distinct impulses (bangs, clicks, clatters, or thumps).
- The noise is irregular enough to attract attention.

From the above the rating level is established, this being the value that is compared with the background noise.

According to BS 4142 a rating level of:

- 10 dB(A) or more above the background is an indication that complaints, attributable to the operation of the noise source, are likely.
- 5 dB(A) above the background is of marginal significance.
- 10 dB(A) below the background is a positive indication that complaints attributable to the operation of the noise source are unlikely.

4.2 Assessment Standards

London Borough of Camden requires the following standards in relation to the environmental impact of noise and vibration from plant and machinery due to development where planning permission will not be granted (see Appendix C);

- Noise levels at 1 metre external to a sensitive façade shall be 5dB(A) less than the existing background measurement (L_{A90}) expressed in dB(A) when all plant is in operation.
- Noise that has a distinguishable continuous note (whine, hiss, screech, hum) or has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade noise levels should be 10dB(A) below the L_{A90}, expressed in dB(A).
- Noise levels at 1 metre external to a sensitive façade where the background noise level is higher than L_{A90} 60dB(A) should be no greater than 55dB L_{Aeq}.

5.0 MEASURED LEVELS

5.1 Basic Assessment

The measured 'A' weighted broad band sound pressure levels from the measurement position are presented in terms of L_{Aeq}, and L_{A90} in Table 1 below. The L_{Aeq} levels are the logarithmic average of all the measurements during that period. The L_{A90} levels have been shown as a minimum to maximum range as there is no valid method to average statistical noise parameters. The levels presented in the tables have been rounded to the nearest decibel. Full data is presented at the end of this report.

Table 1. Summary of Results.

Position	L_{Aeq}, dB.	L_{A90}, min–max, dB.
Rear of proposed development	59	50-55

6.0 DESCRIPTION OF NOISE SOURCES

A combination of traffic on the surrounding local roads and a constant airflow noise emanating from the rear of a laundrette on West End Lane were the main sources of noise.

7.0 BS4142 ASSESSMENT

7.1 Calculation Procedure

To be able to conduct an assessment of the noise impact from the condenser unit at Barclays Bank in accordance with BS4142 we have undertaken calculations based on manufacturers sound power data for the unit. The sound power is given for the unit in terms of L_{WA} and is summarised in the table below;

Table 2. Sound Power Data

Tag	Unit	In-duct sound power L_{WA} [dB]	Sound Pressure Level
CU1	Toshiba RAV-SM563ATE	65	48

The condenser unit is to be located at basement level at the side of the existing Barclays branch. The noise sensitive residence is approximately 5m from the location of the condenser unit at first floor level.

The sound pressure level at the nearest residential façade was calculated by correcting for hemispherical propagation (and assuming an additional reflection in the bank wall) to the nearest façade.

The specific level determined at the residential façade was compared with the measured ambient L_{A90} to determine the assessment in accordance with BS4142.

7.2 Calculation Results

The calculated specific noise level at the façade of the nearest noise sensitive residence can be calculated as follows:

$L_{Aeq} = L_w - 20*\log(r) - 5$

Where r is the distance, in this case 5m.

Based on the above, and a total sound power level of plant of 65dBA the noise level at the nearest receiver can be calculated as 46dBA.

7.3 Comparison with background

PPG24 states that the likelihood of complaints about noise from developments can be assessed, where the Standard is appropriate, using guidance in BS 4142.

As stated in section 4.1, BS4142 compares the noise level produced by the industrial source with the background L_{A90} noise level within the area with the absence of the source.

Details of our assessment are included below.

Lowest Background Noise Level L_{A90}	52 dB
Contribution from source alone L_{Aeq}	46 dB
Acoustic Character Correction	0 dB
Rating Level (BS4142:1997)	44 dB
Excess of Rating Level Over Background Level	-6 dB

In accordance with BS4142 the assessment is below the design criteria and gives an indication that the Condenser Unit will be of marginal significance.

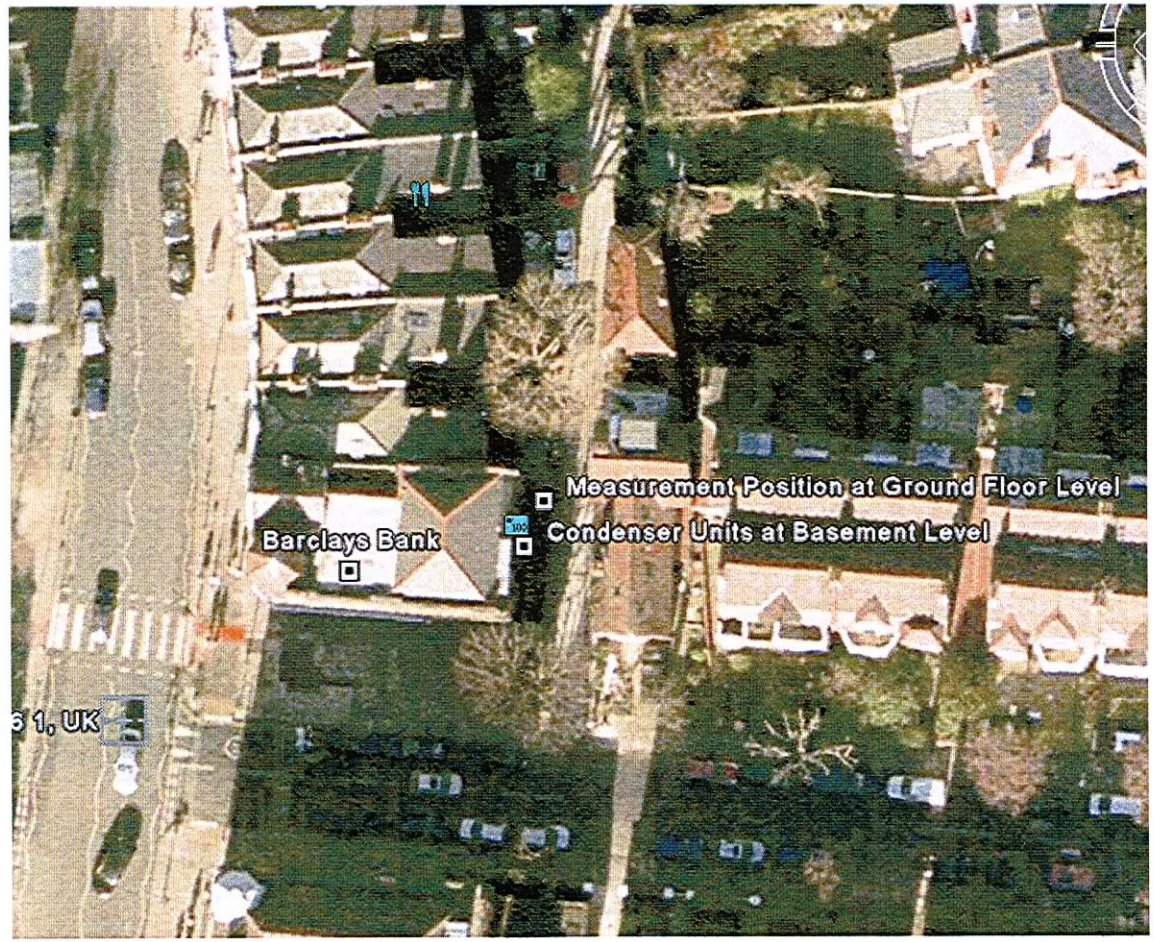
This also meets the requirements of the Camden Replacement Unitary Development Plan – Appendix 1 Noise and Vibration Thresholds, which states that noise levels from plant and machinery should be at least 5dB(A) below the existing background level at 1m external to a sensitive façade.

7.4 Discussion

Note that an acoustic character correction has not been applied. This is because it is generally the case that modern inverter units are not tonal and are designed to run continuously using speed variation rather than intermittent switching to cope with demand. Therefore, as the inverter condenser units are the dominant noise source an acoustic feature correction is generally not appropriate.

Also, the sound power data supplied by manufacturers is generally for the peak capacity of the units at maximum fan speed. Note that we would typically expect the units to be running at a lower capacity and hence noise levels to be reduced from those calculated.

Figure 1
Site Layout and Measurement Position


Measurement Position at Ground Floor Level
Condenser Units at Basement Level
Barclays Bank
1, UK

Appendix A
Summary of Measurements

Barclays Bank, West Hampstead

GRAPH SPREADSHEET

OCTAVE BAND CENTRE FREQ	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
A-WEIGHTING		-39.4	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	-1.1	-6.6
08.15 - 08.30											
Leq	59.1	71.2	68.9	61.0	58.9	58.7	54.4	51.4	48.0	39.7	27.6
Lmax	80.8	85.1	84.1	82.5	77.5	80.8	77.3	71.4	64.8	60.1	54.4
L90	55.0	66.0	64.0	56.0	53.0	51.0	50.0	46.0	40.0	30.0	0.0
08.30 - 08.45											
Leq	60.6	72.5	70.1	62.8	56.6	55.8	55.4	55.0	50.8	44.2	35.8
Lmax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L90	54.0	66.0	64.0	55.0	52.0	50.0	49.0	47.0	42.0	32.0	0.0
08.45 - 09.00											
Leq	58.3	72.0	69.1	60.7	57.7	56.7	54.7	51.5	45.8	39.2	27.2
Lmax	75.3	85.8	82.4	77.9	76.9	74.8	69.8	73.2	66.0	64.5	51.8
L90	54.0	66.0	64.0	54.0	52.0	51.0	49.0	46.0	40.0	29.0	0.0
09.00 - 09.15											
Leq	58.0	71.3	67.9	57.5	53.6	54.4	52.7	52.0	46.9	40.3	28.2
Lmax	80.1	86.0	84.3	80.4	72.5	75.8	71.6	76.8	72.7	66.5	54.4
L90	54.0	65.0	62.0	53.0	51.0	50.0	49.0	46.0	40.0	30.0	0.0
09.15 - 09.30											
Leq	58.7	70.1	67.8	58.1	56.0	56.9	54.5	53.1	48.4	43.5	36.8
Lmax	82.1	86.0	85.9	77.7	73.2	78.3	75.6	79.0	73.9	68.0	62.8
L90	54.0	65.0	62.0	53.0	52.0	51.0	49.0	45.0	39.0	29.0	0.0
09.30 - 09.45											
Leq	61.5	69.9	68.3	58.4	57.5	58.6	56.7	55.3	51.3	44.4	31.2
Lmax	85.6	84.5	86.1	79.0	70.7	76.3	74.0	82.1	79.7	71.8	56.6
L90	54.0	65.0	63.0	53.0	51.0	51.0	49.0	45.0	39.0	28.0	0.0
09.45 - 10.00											
Leq	60.0	68.5	68.4	56.6	54.4	54.6	53.9	54.8	51.6	45.9	31.2
Lmax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L90	54.0	65.0	62.0	53.0	51.0	51.0	49.0	45.0	39.0	31.0	0.0
10.00 - 10.15											
Leq	61.2	68.0	69.3	60.2	56.8	57.1	56.0	54.7	51.7	49.3	40.4
Lmax	85.9	89.0	93.3	82.1	87.3	85.5	82.3	81.1	78.6	78.5	71.5
L90	55.0	61.0	62.0	54.0	52.0	52.0	51.0	50.0	41.0	30.0	0.0
10.15 - 10.30											
Leq	57.3	68.3	68.1	57.5	55.4	54.5	52.8	50.7	45.5	39.0	30.7
Lmax	80.7	84.3	88.6	87.1	84.8	80.0	78.8	77.6	73.5	69.5	67.0
L90	53.0	60.0	60.0	52.0	50.0	50.0	49.0	49.0	37.0	29.0	0.0
10.30 - 10.45											
Leq	61.8	69.2	69.4	57.7	55.7	56.6	54.8	54.8	53.8	54.7	44.7
Lmax	85.7	90.0	95.2	74.2	72.0	76.4	78.8	90.6	81.5	80.1	68.8
L90	55.0	62.0	63.0	53.0	53.0	52.0	50.0	45.0	38.0	27.0	0.0
10.45 - 11.00											
Leq	56.6	66.3	67.4	56.4	55.6	55.3	52.7	50.7	49.2	49.3	36.6
Lmax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L90	53.0	60.0	60.0	52.0	50.0	50.0	49.0	44.0	37.0	27.0	0.0
11.00 - 11.15											
Leq	63.0	70.3	69.2	58.0	54.4	52.3	58.0	51.6	49.2	33.5	0.0
Lmax	84.1	89.3	88.2	87.9	85.1	84.7	79.5	70.4	64.7	54.7	43.8
L90	54.0	60.0	61.0	53.0	52.0	51.0	50.0	45.0	39.0	27.0	0.0
11.15 - 11.30											
Leq	60.7	66.9	66.2	61.5	60.6	59.9	55.9	50.2	43.6	32.5	0.0
Lmax	76.3	79.6	81.1	80.4	77.8	77.0	72.9	65.8	62.6	49.9	37.9
L90	55.0	60.0	61.0	53.0	53.0	54.0	51.0	45.0	38.0	27.0	0.0
11.30 - 11.45											
Leq	57.6	67.5	67.8	57.9	56.2	56.3	53.2	49.5	43.8	37.6	30.5
Lmax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L90	54.0	62.0	61.0	52.0	51.0	51.0	49.0	45.0	38.0	27.0	0.0
11.45 - 12.00											
Leq	57.9	68.6	68.7	57.5	54.7	54.6	53.6	51.4	44.0	35.4	0.0
Lmax	74.7	82.3	81.5	75.4	66.5	67.2	72.1	72.8	61.6	54.7	44.0
L90	54.0	63.0	62.0	54.0	52.0	51.0	50.0	45.0	40.0	31.0	0.0
12.00 - 12.15											
Leq	57.6	66.1	68.4	56.0	56.0	55.1	53.1	49.7	43.5	35.7	0.0
Lmax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L90	54.0	60.0	61.0	53.0	51.0	51.0	50.0	45.0	39.0	28.0	0.0
12.15 - 12.30											
Leq	61.1	68.4	68.8	63.9	62.2	60.1	58.0	50.6	43.2	34.7	0.0
Lmax	81.2	84.2	78.5	83.7	84.2	80.5	76.8	69.2	61.4	50.5	41.9
L90	54.0	60.0	58.0	52.0	51.0	51.0	50.0	45.0	38.0	28.0	0.0
12.30 - 12.45											
Leq	58.1	68.4	68.4	56.5	56.1	55.8	53.8	49.7	44.4	36.8	25.3
Lmax	72.7	83.4	84.6	73.7	69.5	71.9	66.5	67.5	66.5	56.9	46.3
L90	54.0	61.0	61.0	52.0	51.0	51.0	50.0	45.0	38.0	28.0	0.0
12.45 - 13.00											
Leq	57.5	68.2	67.4	58.5	56.1	55.0	53.2	49.3	43.9	36.3	28.1
Lmax	68.7	81.3	80.5	72.9	72.5	69.4	66.3	63.3	65.3	58.7	61.2
L90	53.0	61.0	61.0	52.0	50.0	51.0	49.0	45.0	38.0	29.0	0.0
13.00 - 13.15											
Leq	56.6	67.9	68.7	58.5	53.9	53.3	52.2	49.1	44.3	36.8	27.5
Lmax	68.9	83.6	86.4	78.7	69.0	66.4	66.1	58.9	64.7	57.2	53.2
L90	53.0	61.0	60.0	52.0	50.0	50.0	49.0	45.0	38.0	28.0	0.0
13.15 - 13.30											
Leq	63.4	71.0	74.0	68.8	65.3	62.2	58.1	51.8	45.1	37.5	25.4
Lmax	78.8	82.1	86.6	81.0	79.9	76.0	73.6	67.2	65.9	47.8	38.4
L90	54.0	62.0	62.0	52.0	51.0	51.0	50.0	45.0	39.0	29.0	0.0
13.30 - 13.45											
Leq	57.5	69.4	66.6	56.8	55.2	54.4	52.5	49.1	49.4	40.8	36.1
Lmax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L90	54.0	63.0	61.0	52.0	52.0	51.0	50.0	46.0	40.0	29.0	0.0
13.45 - 14.00											
Leq	58.8	69.3	69.5	58.2	55.9	56.2	54.6	53.7	48.6	39.4	28.3
Lmax	77.2	88.4	88.0	81.6	77.1	80.8	72.0	73.4	68.7	59.7	51.7
L90	55.0	62.0	61.0	52.0	52.0	52.0	50.0	46.0	40.0	30.0	0.0
14.00 - 14.15											
Leq	57.2	67.8	68.7	57.4	54.4	54.3	52.6	49.5	44.7	38.0	29.9
Lmax	73.0	87.1	89.0	78.2	69.7	72.5	67.6	67.3	61.6	54.1	51.2
L90	54.0	61.0	61.0	52.0	51.0	51.0	50.0	45.0	40.0	29.0	0.0
14.15 - 14.30											
Leq	57.6	69.0	68.9	58.7	56.7	55.3	53.2	49.7	44.5	36.8	0.0
Lmax	73.8	86.5	82.9	76.2	76.3	72.9	67.7	60.5	58.9	53.0	43.6
L90	54.0	61.0	61.0	52.0	51.0	51.0	50.0	46.0	40.0	30.0	0.0
14.30 - 14.45											
Leq	56.4	67.2	66.4	57.0	54.0	53.5	51.9	48.9	43.6	36.7	27.6
Lmax	73.9	80.2	85.4	80.7	69.7	77.1	66.2	64.9	62.3	56.1	55.4
L90	53.0	60.0	60.0	51.0	50.0	50.0	49.0	45.0	39.0	29.0	0.0
14.45 - 15.00											
Leq	58.3	67.3	67.9	58.9	52.9	53.0	51.9	48.9	44.4	37.2	24.7
Lmax	67.5	80.3	81.7	71.8	65.7	69.8	64.1	66.4	57.9	49.7	42.3
L90	54.0	61.0	61.0	52.0	50.0	50.0	49.0	45.0	40.0	30.0	0.0
15.00 - 15.15											
Leq	56.4	67.4	67.4	56.5	53.2	53.1	52.1	49.0	44.1	37.3	30.0
Lmax	71.5	85.3	89.0	74.2	69.0	66.8	69.3	61.3	60.8	56.6	61.0
L90	54.0	62.0	61.0	52.0	50.0	50.0	50.0	46.0	40.0	30.0	0.0
15.15 - 15.30											
Leq	56.5	67.0	67.1	57.0	54.2	53.7	52.4	48.8	43.5	35.4	24.8
Lmax	69.5	81.0	83.6	78.9	67.9	70.3	66.3	64.8	61.2	53.4	49.1
L90	54.0	60.0	60.0	51.0	51.0	51.0	49.0	45.0	39.0	29.0	0.0
15.30 - 15.45											
Leq	57.2	67.1	69.2	60.5	54.1	53.8	52.8	49.9	44.5	37.5	26.1
Lmax	68.4	81.5	87.4	84.0	66.2	64.7	62.5	57.9	60.0	52.9	45.0
L90	54.0	61.0	62.0	52.0	51.0	51.0	50.0	46.0	40.0	30.0	0.0
15.45 - 16.00											
Leq	57.1	66.3	66.2	56.7	54.4	54.2	52.9	49.8	43.3	35.8	0.0
Lmax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L90	54.0	58.0	59.0	51.0	50.0	50.0	50.0	46.0	39.0	29.0	0.0
16.00 - 16.15											
Leq	57.1	67.7	68.3	58.0	54.6	53.4	52.7	50.1	44.2	36.9	26.6
Lmax	71.7	89.4	85.1	75.3	69.4	69.5	67.2	69.7	65.5	58.3	54.1
L90	53.0	61.0	61.0	51.0	50.0	49.0	49.0	45.0	39.0	28.0	0.0
16.15 - 16.30											
Leq	58.2	66.0	66.8	56.9	53.3	52.2	51.7	49.3	43.2	35.2	26.4
Lmax	72.3	93.0	92.7	72.4	66.3	66.8	64.4	69.2	58.1	61.6	58.9
L90	52.0	60.0	60.0	51.0	49.0	48.0	48.0	45.0	37.0	27.0	0.0
16.30 - 16.45											
Leq	56.5	66.7	66.2	57.3	54.7	53.0	51.9	49.5	43.4	34.8	25.4
Lmax	70.1	81.1	81.6	72.7	71.6	67.1	62.1	65.7	56.7	56.0	57.0
L90	52.0	60.0	60.0	51.0	49.0	49.0	48.0	45.0	37.0	27.0	0.0
16.45 - 17.00											
Leq	58.7	66.3	69.6	58.8	55.0	53.3	52.3	49.6	43.7	36.7	30.4
Lmax	91.7	92.3	99.1	96.3	95.8	80.3	78.5	75.2	71.5	69.4	67.3
L90	52.0	61.3	61.0	51.0	49.0	48.0	47.0	44.0	37.0	27.0	0.0
17.00 - 17.15											
Leq	58.1	69.2	68.9	62.5	56.0	53.6	54.2	51.0	47.7	42.2	37.7
Lmax	71.3	79.5	83.4	74.9	73.3	74.4	67.6	62.2	65.4	61.4	65.6
L90	52.0	61.0	61.0	52.0	50.0	48.0	47.0	44.0	38.0	29.0	0.0
17.15 - 17.30											
Leq	58.8	65.3	66.7	56.6	53.3	52.7	51.8	48.5	41.9	32.6	0.0
Lmax	69.1	79.1	79.7	71.6	67.6	70.3	65.3	64.2	59.6	48.0	46.6
L90	52.0	59.0	60.0	51.0	49.0	48.0	47.0	44.0	38.0	29.0	0.0
17.30 - 17.45											
Leq	58.3	66.9	66.1	55.9	53.4	52.9	51.9	49.6	42.7	34.3	30.0
Lmax	76.5	85.5	82.4	80.2	74.5	74.8	72.0	68.3	58.9	53.4	57.9
L90	52.0	60.0	61.0	52.0	50.0	48.0	48.0	45.0	37.0	29.0	0.0
17.45 - 18.00											
Leq	57.2	67.0	67.2	57.5	54.6	53.4	52.9	50.6	43.5	35.1	0.0
Lmax	70.9	77.5	85.1	74.7	72.6	72.4	68.2	61.7	57.3	52.6	41.1
L90	53.0	61.3	61.0	52.0	50.0	49.0	48.0	45.0	38.0	27.0	0.0

Appendix B
Noise Source Data

Technical specifications **heat pump**

Outdoor unit		RAV-SM563AT-E	RAV-SM803AT-E	RAV-SM1103AT-E	RAV-SM1403AT-E
		2 HP	3 HP	4 HP	5 HP
Air flow	m^3/h - l/s	2400 - 667	2700 - 750	4000 - 1250	4300 - 1250
Sound pressure level, cooling	dB(A)	46	48	53	54
Sound power level, cooling	dB(A)	63	65	70	71
Operating range, cooling	°C	-15 to 43	-15 to 43	-15 to 43	-15 to 43
Sound pressure level, heating	dB(A)	48	50	54	54
Sound power level, heating	dB(A)	65	67	71	71
Operating range, heating	°C	-15 to 15	-15 to 15	-15 to 15	-15 to 15
Dimensions (H x L x D)	mm	550 x 780 x 290	550 x 780 x 290	795 x 900 x 320	795 x 900 x 320
Weight	kg	38	42	77	77
Compressor type		DC twin rotary	DC twin rotary	DC twin rotary	DC twin rotary
Flare connections gas - liquid	in	1/2 - 1/4	5/8 - 3/8	5/8 - 3/8	5/8 - 3/8
Maximum pipe length	m	30	30	50	50
Maximum height difference	m	30	30	30	30
Pre-charged pipe length	m	20	20	30	30
Power supply	V-ph-Hz	220/240-1-50	220/240-1-50	220/240-1-50	220/240-1-50

Appendix C
Camden Replacement Unitary Development Plan
Appendix 1 Noise and Vibration Thresholds

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90 >60dB	Day, evening and night	0000-2400	55dB $_{LAeq}$

Appendix D
Glossary of Acoustic Terms (Environmental)

Definition of Acoustic Terms (Environmental)

The decibel

This is the basic unit of noise, denoted dB.

A Weighting

This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) L_{eq} or 50 dB L_{Aeq}. Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and $L_{eq(s)}$

This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq} or, for A-weighted figures dB(A) L_{eq} or dB L_{Aeq}. It can also be expressed in terms of frequency analysis (see later). $L_{eq(s)}$ is the sample L_{eq} level.

L_n

This is the level exceeded for n% of the time. It is denoted dB L_n or, for A-weighted figures dB(A) L_n or dB L_{An}. It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically, it is the median.

L_{max}

This is the maximum level reached during a measurement period. The "time constant", or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. "Fast", "Slow", etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) L_{max}, dB L_{Amax}, etc. It can also be expressed in terms of frequency analysis.

Frequency Analysis

Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq}, L_{90}, L_{max} etc. One third octave band analysis uses 30 bands.

Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.