REPORT TITLE:

18 Kidderpore Gardens London NW3 7SR- Environmental Noise Survey Report and Plant Noise Assessment

CLIENT DETAILS:

XUL Architecture

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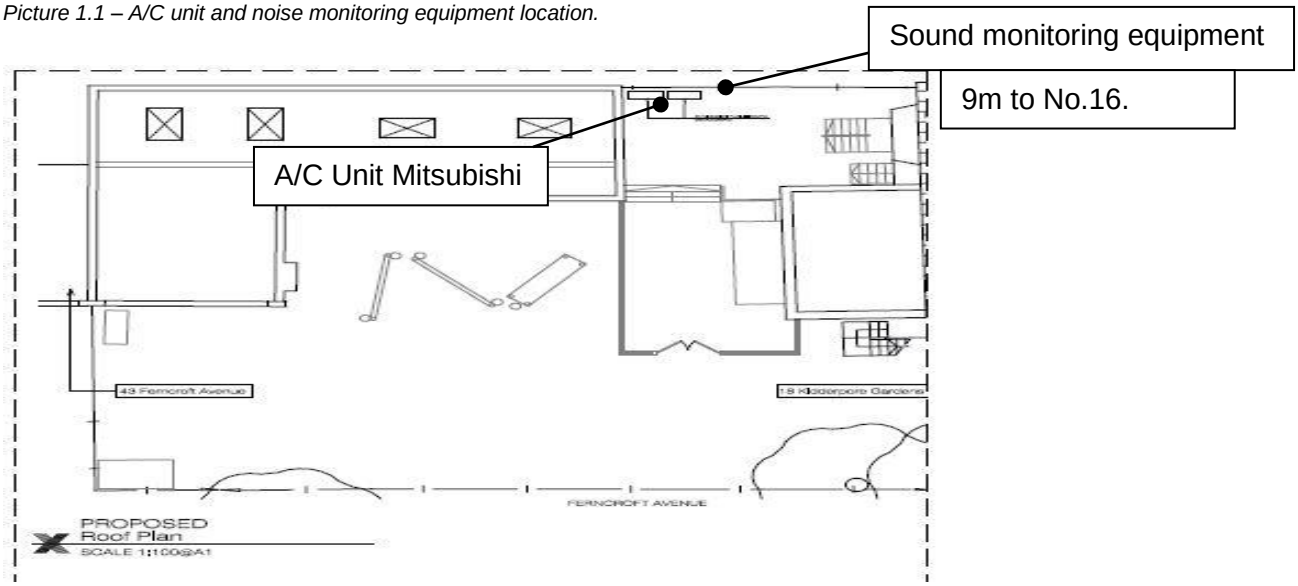
1. Introduction

1.1 Background noise levels representative of those experienced by the nearest affected residential receptors to St Margarets Primary School, 18 Kidderpore Gardens London, NW3 7SR have been measured over a weekly period, in order to provide limiting criteria in accordance with BS4142: 2014, 'Methods for rating and assessing industrial and commercial sound'.

1.2 This report sets out the environmental noise levels in the area immediately surrounding a proposed air conditioning unit installation, and makes recommendations for noise limits against which the system should be designed. Limiting criteria are developed in accordance with BS4142: 2014, 'Methods for rating and assessing industrial and commercial sound'.

1.3 The site is mainly affected by road traffic noise, mostly during the morning. The noise output of the air conditioning unit is assessed against noise limits derived from background noise levels recorded. The results that were recorded during the week were skewed due to the Kitchen extractor fan being operational during school hours. Results that were recorded during the weekend have been used in their place. Requirements for acoustic control of the unit are discussed within this report. The plan of the scheme showing the proposed a/c unit location is given below.

Picture 1.1 – A/C unit and noise monitoring equipment location.



2. Assessment Methodology

2.1 National Planning Policy Framework

2.1.1 The National Planning Policy Framework (NPPF) 2018 sets out the general requirements for gaining planning permission. Comments regarding noise found within the document are as follows.

S15. Para 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.

S15. Para 180

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 60;

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; and

See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).

2.2 Noise Policy Statement for England

2.2.1 The NPPF references the Noise Policy Statement for England (NPSE) which intern references two concepts used by the World Health Organisation (WHO) which can be used to ascertain relevant noise levels for individual sites. The concepts are LOAEL (Lowest Observed Adverse Effect Level) and SOAEL (Significant Observed Adverse Effect Level). The NPPF then gives three aims to adhere to:

Aim 1 – Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Aim 2 – Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy of sustainable development.

Aim 3 – Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

2.2.2 To avoid 'significant adverse impacts on health and quality of life', by creating a situation where the impact of noise lies below the SOAEL we will refer to BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound'.

2.3 BS4142:2014 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas

2.3.1 BS4142 has been revised and the 1997 edition has been replaced. The standard sets out a methodology for the assessment of whether noise from factories, industrial premises or fixed installations and sources of an industrial/commercial nature.

2.3.2 The procedure contained in BS4142 for assessing the likelihood of complaints is to compare the measured or predicted noise level from the source in question, the 'specific noise level', at the assessment position with the correct background noise level for the worst case time of operation.

2.3.3 Where the noise contains a 'distinguishable, discreet, continuous note (whine, hiss, screech, hum etc.) or if there are distinct impulses in the noise (bangs, clicks or clatters), or if the noise is irregular enough to attract attention' then a range of correction factors can be added to the specific noise level as appropriate to obtain the 'rating level'.

2.3.4 As the type and noise output of the A/C condenser is known, this report includes the assessment of the manufacturers noise data in terms of noise output. The assessment is made including penalties for the type of unit operation expected which is non-tonal, but intermittently on and off throughout the day and night time. A margin of error is also included in the assessment to account for measurement tolerance between identical set ups.

2.3.5 Overall rating noise levels will be specified for the new installation. Compliance with the rating value will be necessary to provide evidence that significant adverse impact has been avoided as required by the NPSE.

2.3.6 To assess the likelihood of complaints, the measured background noise level is subtracted from the rating noise level. BS4142 states:

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessment and arriving at decisions, therefore, it is essential to place the sound in context.

Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (See Clause 8) from the rating level (see Clause 9) and consider the following.

a) Typically the greater the difference, the greater the magnitude of the impact.

b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around 5dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

1) *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

   Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) *The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.*

3) *The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as;*

i) *Façade sound insulation treatment*

ii) *Ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*

iii) *Acoustic screening.*

2.3.6 In summary, the BS4142: 2014, 'Methods for rating and assessing industrial and commercial sound' would indicate that compliance with the wider aims of the NPSE is achieved when a rating level does not exceed the background sound level for the given time of operation.

2.3.7 Many local authorities have their own criteria which go beyond the requirements of BS4142. It is common to see rating levels of -5dB or -10dB below the background noise level, called for.

3. Survey Method and Equipment

3.1 Survey

3.1.1 The noise survey was carried out between 11th & 18th October 2018 to measure representative noise levels at the site during a typical 24 hour weekday period.

3.1.2 The noise survey comprised of unattended monitoring at the new plant installation location with a view of the closest sensitive receptor, 16 Kidderpore Gardens.

3.1.3 Monitoring was carried out at a height of 3m above local ground level.

3.1.4 Noise measurements were made with a calibrated precision grade sound level meter (Svantek 971 SN: 34937) which achieves the requirements of BS EN 61672:2003. The survey was carried out in accordance with the principles of BS 7445:1997 Parts 1 - 3, 'Description and Measurement of Environmental Noise', British Standard BS4142: 2014, 'Methods for rating and assessing industrial and commercial sound'.

3.2 Measurement Parameters

3.2.1 Human ears are able to respond to sound over the frequency range of about 20 Hz to 20 kHz 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, and is more responsive to mid-frequencies than to lower or higher frequencies.

3.2.2 To quantify noise in a manner that approximates to 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.

3.2.3 The most widely used weighting mechanism that 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.

3.2.4 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) of a steady source is generally regarded as the minimum difference needed to perceive a change.

3.2.5 Environmental noise has been measured in the following indices;

$LA_{eq,\ T}$ - The A-weighted equivalent continuous sound pressure level. A representation of a continuous sound level containing the same amount of sound energy as the measured varying noise over the measurement period, t.

$LA_{90,\ T}$ - The A-weighed sound pressure level that is exceeded for 90% of the measurement period, t. This is commonly used as the 'Background Noise Level' for assessing the effects of industrial noise in the UK.

LA_{max} - The highest A-weighted noise level recorded during a noise measurement period.

3.3 Equipment

Svantek precision grade sound level meter type 971 serial No. 34937.

Environmental wind shield kit

The sound level meter was calibrated before and after the survey. No drift was noted between the two reference checks. The equipment used is compliant with IEC 61672:2002 as a Type 1 meter.

3.4 Weather & Site Conditions

3.4.1 The climatic conditions during the noise survey were approx. 18 degrees C with light winds (< 5m/s) and no witnessed occurrence of rain. Conditions were considered conducive to environmental noise measurement.

3.4.2 The site was an active Primary School as such daytime values used in setting limiting criteria have discounted working hours of 09:00-17:30hrs due to an kitchen extractor fan creating high background levels; values measured on the weekend have been used instead.

4. Survey Results

4.1 The measurement survey comprised of consecutive measurement periods in terms of the most relevant standards and guidelines. The summary table below shows the period noise levels measured at the site boundary with the adjacent property (No. 16). Results from the survey are graphically presented as Figure 1.

Table 4.1: Summarised L_{Aq} and L_{A90} background noise data

Day	***Time period***	***L_{Aeq}***	***Lowest Recorded L_{90}***
Thursday 11th October	Day (12:30 – 23:00)	61.5	49.2
	Night (23:00 – 07:00)	45.9	44.8
Friday 12th October	Day (07:00 – 23:00)	61.1	53.3
	Night (23:00 – 07:00)	46.7	47.2
Saturday 13th October	Day (07:00 – 23:00)	49.7	49.9
	Night (23:00 – 07:00)	41.3	33.7
Sunday 14th October	Day (07:00 – 23:00)	48	49.9
	Night (23:00 – 07:00)	47.4	45.9
Monday 15th October	Day (07:00 – 23:00)	56.2	54.9
	Night (23:00 – 07:00)	37.7	38.7
Tuesday 16th October	Day (07:00 – 23:00)	54.6	48.2
	Night (23:00 – 07:00)	39.8	41.4
Wednesday 17th October	Day (07:00 – 23:00)	53.2	46.0
	Night (23:00 – 07:00)	37.3	38.5
Thursday 18th October	Day (07:00 – 23:00)	61.0	57.6

4.2 The above minimum whole number background noise levels during the day (45.9dB) and night (33.7dB) recorded, are to form the basis of limiting noise criteria for noise emission from new mechanical services equipment serving the building.

4.3 A graph of measured data from the site is provided at the rear of this report and full survey data is available on request.

5. Noise from Fixed Installations and Mechanical Plant

5.1 Noise levels generated by mechanical plant and experienced by local receptors depends upon a number of variables, the most significant of which are considered to be as follows.

- Noise generated by plant or equipment used on site, generally expressed as sound power levels (SWL)
- Distance between the noise source and the receptor
- Attenuation due to ground absorption, atmospheric and barrier effects
- Periods of operation of the plant on the site, known as its “on-time”

5.2 In order to ensure that background noise levels at the nearest noise sensitive receptors do not increase significantly as a result of the development, design noise limits for electrical and mechanical plant have been provided.

5.3 Noise limits have been calculated to be equal to the background noise level that was recorded during the day.

Noise Limit at Nearest Sensitive Receptors for Fixed Installations of Mechanical Plant, $L_{Ar,Tr}$ (dB)	
Day (07:00 – 23:00)	45.9dBA
Night (23:00-07:00)	33.7dBA

5.4 Plant installed which displays noticeable characteristics as defined by BS4142: 2014, ‘Methods for rating and assessing industrial and commercial sound’ would result in the reduction of the above values dependent upon the characteristics and significance of these in the context of the location.

5.5 As condenser equipment it is expected that intermittent operation will occur, a margin of uncertainty is also included to account for measurement tolerance between identical measurements and equipment, even when calibrated, variance between readings is to be expected.

5.6 BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound' offers the following commentary on penalty corrections to derive the overall rating sound level.

Tonality
For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity
A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

Other sound characteristics
Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied. NOTE 2 Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

Intermittency
When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

E.13 Accuracy and uncertainty
Although the level of uncertainty due to the instrumentation system can be quantified, this is unlikely to be practical be for some of the other measurement uncertainties. The level of uncertainty can be reduced by several methods, including taking more measurements, for longer measurement time intervals, on different occasions over longer periods of time, under differing suitable weather conditions. What is appropriate will depend upon the particular circumstances of each assessment, including the scale of the proposed development and the risk of it causing significant adverse impact. Consideration ought to be give n to any published information that is relevant to the assessment
It has been found [7, 8] that the mean standard deviations of the results of sixteen different noise examples from four laboratories using four different measuring set-ups was 0.3 on the prominence P and 0.6 dB on the

adjustment KI.

5.7 The Mitsubishi PUZ-ZM60VHA condenser unit will be operate in an intermittent fashion during school operating hours; as such this assessment has been given a penalty of +3dB. With the accuracy budget of +0.6dB added, this creates a correction of +3.6dB (4dB) to be applied in the calculation of the rating sound level in this assessment.

6. Assessment of Noise from Mechanical Plant

6.1 Proposed Plant Installation

6.1.1 The proposed external noise source is a condenser unit, with technical data as follows:

Note. Outdoor unit noise levels are measured at a distance of 1m as verified by the manufacturer. Calculations were undertaken to assess the external noise levels at 1m from the adjacent residential dwelling.

Note. The unit's primary function is as a cooling system, as such cooling noise levels are considered for assessment.

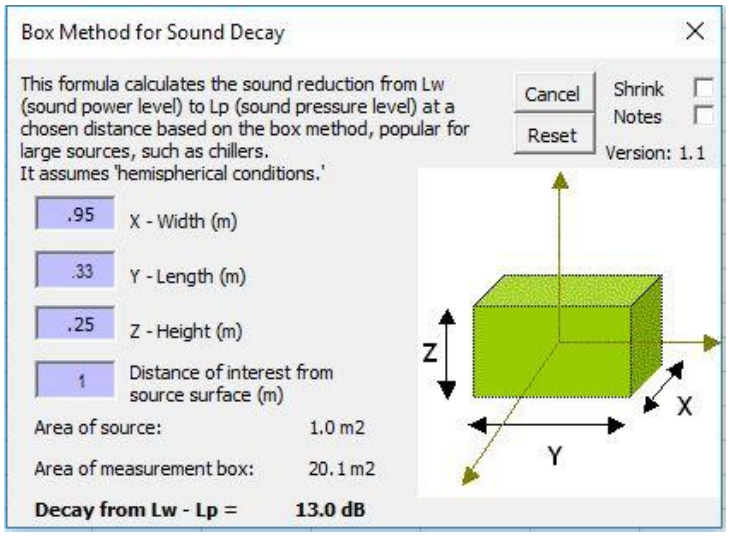
PUZ-ZM60VHA	
49 / 47	Heating/Cooling Noise level (SPL dBA @ 1m)
67	
70	
950 x 330 + 25 x 943	
220-240v, 50Hz	
Single	
1.732 / 1.560 1.25 / 1.65	
6.0	
7.41 / 6.65 [19.4]	
25	
3	
55	
30	
2.80 / 1.89	
0.80 / 0.54	

6.1.2 These calculations take into account distance from the unit to the property (9m). The combined external noise level at the nearest residential receiver is shown below along with pertinent distance corrections.

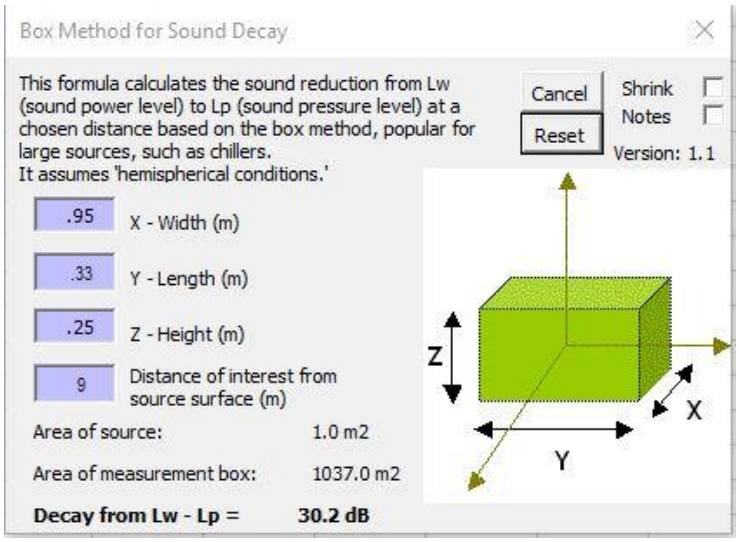
6.2 Distance Corrections

6.2.1 Box method for hemispherical distance corrections:

To 1 metre:



To 9 metres



6.2.2 The difference between corrections from 1m (already inherent within the manufacturer's noise data) to 9m is 17.2dB which accounts for sound radiating hemispherically.

6.3 Mechanical plant noise levels at the nearest residential receiver without additional attenuation

6.3.1 Daytime Calculation:

Calculation Element	Level (dB)
Specific Noise Level	47dBA @ 1m
Residual Sound Level (LAeq)	48dBA
Distance Correction (1m - 9m)	-17dB
Characteristics & Accuracy Penalties	+4dB
Rating Noise Level	35dB
Background noise level (L_{A90})	46dB
Difference	-11dB

6.3.2 The calculation shows that the background noise level at the nearest residential receiver would be unaffected by the proposed Mitsubishi air condenser during the day.

6.3.3 Additional attenuation measures won't be required for the proposed piece of plant because the specific noise level won't be exceeding the residual sound level.

7. Conclusions

7.1 The background noise conditions at adjacent noise sensitive receptor to 18 Kidderpore Gardens NW3 7SR.

7.2 The site is in a moderately busy area due to traffic noise, and noise limiting criteria have been established in accordance with national planning policy and making an allowance of equal to the background noise level to satisfy the local authority.

7.3 The proposed plant has been assessed and the resulting noise levels at the nearest residential receiver have been calculated. Unattenuated noise levels are expected to to be lower than the measured background noise level, so attenuation is not considered necessary.

Figure 1 - Graphical Representation of Environmental Noise

The highlighted areas (orange) represents the results that are affected by the extractor fan that is attached to the external wall of the kitchen. The area which is highlighted green shows the results of the weekend period.