ENVIRONMENTAL NOISE AND IMPACT ASSESSMENT

6 Nutley Terrace

For the Discharge of Planning Condition 11 and 12

Produced by XCO2 for KSR Architects

September 2019

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CONTENTS

	01	02		
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Date	08/05/2018	12/09/2019		
Project reference	9.106	9.106		

EXECUTIVE SUMMARY

The redevelopment of the site at 6 Nutley Terrace, London NW3 5BX, to provide two new dwellings, includes the installation of services plant within the rear gardens.

London Borough of Camden has granted conditional permission for the development, with two conditions (11 and 12) related to noise from the proposed plant.

NOISE IMPACT ASSESSMENT

An environmental noise survey has been undertaken at 6a and 6b Nutley Terrace, London, to determine the representative background sound level at the nearest noise-sensitive premises.

The noise levels from the proposed new plant to be installed at the nearest noise-sensitive receptors has been calculated and compared with the requirements in the London Borough of Camden's Planning Condition 11.

The assessment shows that, with attenuation provided by screening between the proposed plant and the nearest windows, plant noise levels at 1m from the nearest residential premises are at least 5 dBA below the background sound level and therefore meet the requirements of Planning Condition 11.

This report, in conjunction with design drawings, manufacturer's data sheets and appropriate commitments to install and maintain the plant and attenuation, will demonstrate compliance with Conditions 11 and 12.

INTRODUCTION

The proposed redevelopment of the site at 6 Nutley Terrace, London NW3 5BX entails the demolition of the existing house at the site and the construction of two new dwellings, 6A and 6B.

Each of the new houses will be serviced with two external air conditioning condensers and two external air source heat pump units, to be installed in the respective rear gardens.

SITE LOCATION

The site is located at 6 Nutley Terrace, within the London Borough of Camden (See Figure 1 below).

Figure 1: Site location map

PLANNING POLICIES

A great deal of change has occurred in recent years in the assessment of noise impacts and their relationship with planning decisions. The following sections introduce the applicable policies, either national or local, which ought to be considered to support the planning application. It should be highlighted that the assessment is mainly addressed to the local planning authority.

NOISE POLICY STATEMENT FOR ENGLAND

The Noise Policy Statement for England (NPSE[1]), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are: "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *avoid significant adverse effects on health and quality of life;*
- *mitigate and minimise adverse effects on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and quality of life occur.

The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the NPSE). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case: *"...all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."*

Importantly, the NPSE goes on to state that: "*This does not mean that such adverse effects cannot occur."*

The NPSE does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question. NPSE advises that: *"Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

[1] Noise Policy Statement for England, Defra, March 2010

NATIONAL PLANNING POLICY FRAMEWORK

The National Planning Policy Framework (NPPF[2]) was published in March 2012. One of the documents that the NPPF replaces is Planning Policy Guidance Note 24 (PPG 24[3]) "Planning and Noise."

Paragraph 109 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land stability."*

The NPPF goes on to state in Paragraph 123 "*planning policies and decisions should aim to:*

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including thorough use of conditions;*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land use since they were established, and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value."*

The NPPF document does not refer to any other documents or British Standards regarding noise other than the NPSE.

Paragraph 11 of the NPPF states that "*planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*

Paragraph 12 of the NPPF states that "*This National Planning Policy Framework does not change the statutory status of the development plan as the starting point for decision making. Proposed development that accords with an up-to-date Local Plan should be approved, and proposed development that conflicts should be refused unless other material considerations indicate otherwise. It is highly desirable that local planning authorities should have an up-to-date plan in place."*

Paragraph 13 of the NPPF states that *"the National Planning Policy Framework constitutes guidance for local planning authorities and decision-takers both in drawing up plans and as a material consideration in determining applications."*

Therefore, if a development/local plan does not align closely with the NPPF, planning decisions should be based on assessments which align with the NPPF. So for instance if a development is refused permission due to conflicts with the local plan, this decision can be overturned (i.e. via the appeal process) if the local plan did not closely align with the aims in the NPPF.

Paragraph 17 of the NPPF states that one of the 12 principles of planning is that it should "*not simply be about scrutiny, but instead be a creative exercise in finding ways to enhance and improve the places in which people live their lives."*

[2] National Planning Policy Framework, DCLG, March 2012
[3] Planning Policy Guidance 24: Planning and Noise, DCLG, September 1994

Paragraph 111 states that *"Planning policies and decisions should encourage the effective use of land by re-using land that has been previously developed (brownfield land), provided that it is not of high environmental value. To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account."*

PLANNING PRACTICE GUIDANCE – NOISE

As of March 2014, a Planning Practice Guidance (PPG[4]) for noise was issued which provides additional guidance and elaboration on the NPPF. It advises that when plan-making and decision-taking, the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). NOAEL differs from NOEL in that it represents a situation where the acoustic character of an area can be slightly affected (but not such that there is a perceived change in the quality of life). UAEL represents a situation where noise is 'noticeable', 'very disruptive' and should be 'prevented' (as opposed to SOAEL, which represents a situation where noise is 'noticeable' and 'disruptive', and should be 'avoided').

As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

The LOAEL is described in PPG[5] as the level above which *"noise starts to cause small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life."*

PPG identifies the SOAEL[5] as the level above which *"noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area."*

In line with the Explanatory Note of the NPSE, the PPG goes on to reference the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG[6] acknowledges that *"...the subjective nature of noise means*

[4] Planning Practice Guidance – Noise, http://planningguidance.planningportal.gov.uk/blog/guidance/noise/, 06 March 2014
[5] Paragraph: 005 Reference ID: 30-005-20140306
[6] Paragraph: 006 Reference ID: 30-006-20141224

that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation."

The relevant guidance in the PPG in relation to the adverse effect levels is summarized in Table 1.

Table 1. PPG guidance on adverse effect levels

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not Noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not Intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very Disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

The Planning Practice Guidance[7] states the following in relation to mitigation measures:

> *"For noise sensitive developments mitigation measures can include avoiding noisy locations; designing the development to reduce the impact of noise from the local environment; including noise barriers; and, optimising the sound insulation provided by the building envelope. Care should be taken when considering mitigation to ensure the envisaged measures do not make for an unsatisfactory development."*

[7] Paragraph: 008 Reference ID: 30-008-20140306

In addition[8]:

"consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations".

LOCAL PLAN POLICY

The London Borough of Camden has granted conditional permission for the 6a and 6b Nutley Terrace three storey plus basement single-family dwelling houses (Class C3) (Application Ref: 2015/7025/P). The two conditions relating to noise from the proposed new plant have been imposed and are set out in the following sections based on the Decision document released by Camden.

This report, in conjunction with design drawings, manufacturer's data sheets and appropriate commitments to install and maintain the plant and any attenuation, will demonstrate compliance with these Conditions.

PLANNING CONDITION 11

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/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/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).
Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policy CS5 of the London Borough of Camden Local Development Framework Core Strategy and policies DP26 and DP28 of the London Borough of Camden Local Development Framework Development Policies.

PLANNING CONDITION 12

Prior to commencement on the relevant part of the development details of the proposed Air Source Heath Pumps (ASHP) including a noise impact assessment (to demonstrate compliance with condition 11) and manufacturer's specification (including details of maximum noise output when they are in operation, cumulative noise output, a plan showing distance to the nearest windows of residential property and background noise levels), and mitigation measures if necessary shall be submitted to and approved in writing by the Council. The ASHP shall be installed in accordance with the details thus approved and permanently retained and maintained thereafter.
Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policy CS5 of the London Borough of Camden Local Development Framework Core Strategy and policies DP26 and DP28 of the London Borough of Camden Local Development Framework Development Policies.

[8] Paragraph: 006 Reference ID: 30-006-20141224

MEASUREMENT OF NOISE LEVELS

The following section describes the methodology undertaken to establish the environmental noise levels around the site.

DETAILS OF ENVIRONMENTAL SOUND SURVEY

Continuous measurements of the incident sound pressure levels at the site were undertaken from 11:30 on Monday 23rd April to 14:15 on Tuesday 24th April 2018. The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices and corresponding octave band frequency information (for L_{eq}) for consecutive sample periods for the duration of the survey.

MEASUREMENT POSITIONS

The measurements of incident sound levels were undertaken within the rear garden of 6 Nutley Terrace. The approximate location of the sound level meter is indicated in the aerial photograph below along with the approximate location of nearest noise sensitive receptors Figure 2.

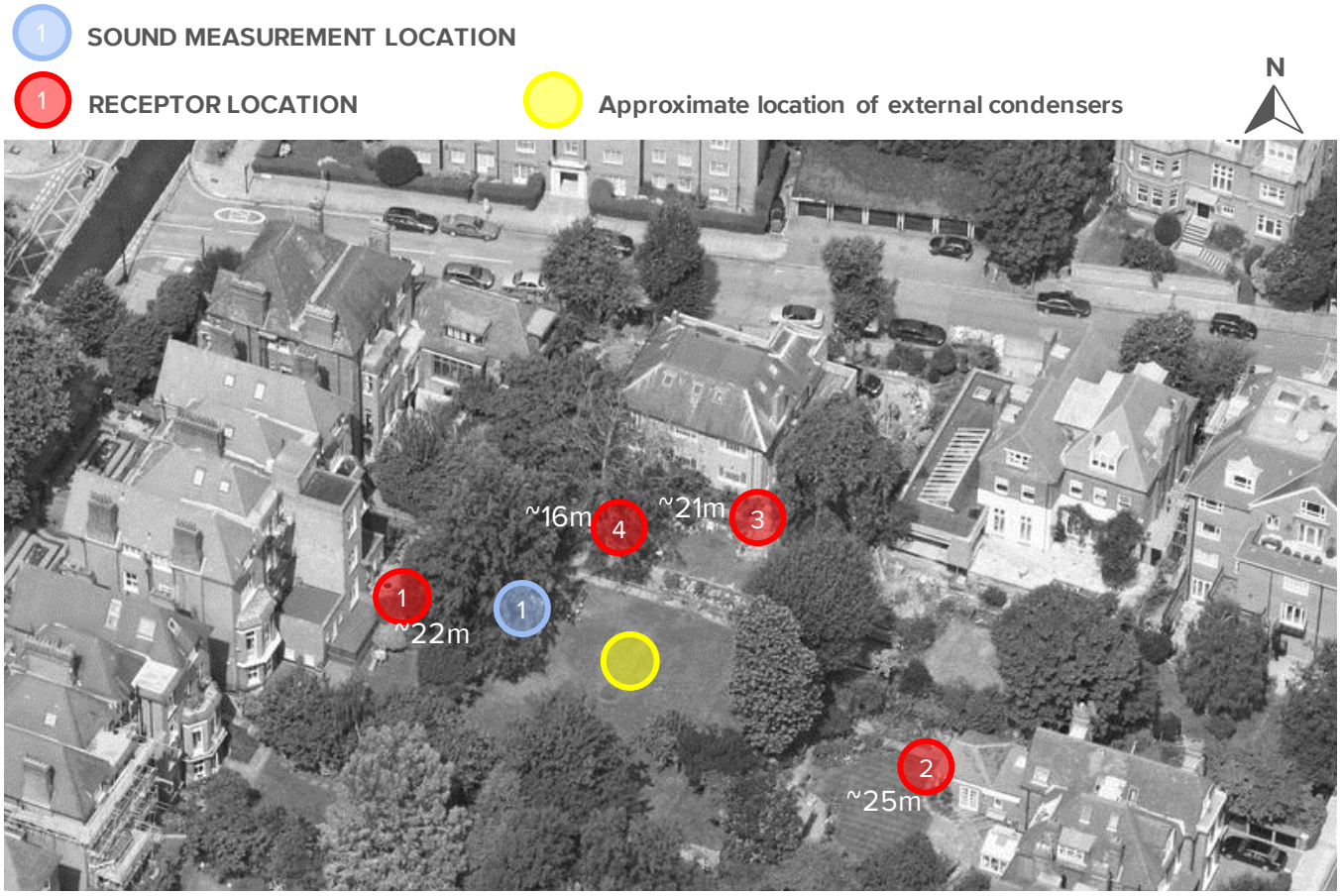


Figure 2: On site sound pressure level measurement positions

The microphone was located approximately 1.5m above the ground. In accordance with BS 7445-2:21991 'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use', the measurements were undertaken under free-field conditions.

EQUIPMENT

Details of the equipment used during the survey are provided in Table 2 below. The sound level meters were calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

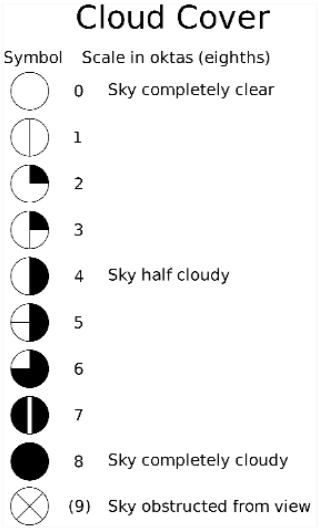
Table 2. On site instrumentation

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-31 / 00593603	18/05/2016	14990
Condenser microphone	Rion UC-53A / 316133		
Preamplifier	Rion NH-21 / 30367		
Calibrator	Rion NC-74 / 35094453	09/03/2018	TCRT18/1141

WEATHER CONDITIONS

Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. Table 3 presents the weather conditions recorded on site at the beginning and end of the survey.

Table 3. Weather Conditions

Date/Time	Description	Beginning of Survey	End of Survey
23 April 2018 – 24 April 2018	Temperature (°C)	18	21
	Precipitation:	No	No
	Cloud cover (oktas - see guide)	7	8
	Presence of fog/snow/ice	No	No
	Presence of damp roads/wet ground	No	No
	Wind Speed (m/s)	0.5	0.4
	Wind Direction	W	W
	Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

*no influence in the conclusions of the assessment

RESULTS

The noise measurements are representative of the noise climate of the rear façades of the neighbouring houses. The predominant noise source was observed to be local road traffic, with aircraft and other transient sources of noise (such as children playing) intermittently audible.

EXTERIOR NOISE LEVELS

The single figure free field noise indices recorded are presented in tabular format within Appendix B. The relevant results of the survey have been summarised in Table 4 overleaf.

Table 4. Summary of survey results (free field levels)

Measurement period	Range of recorded sound pressure levels (dB)			
	LAmax, T	Leq, T	LA10, T	LA90, T
Daytime (07.00 – 23.00 hours)	50-80	43-62	45-70	41-46
Night-time (23.00 – 07.00 hours)	45-72	36-58	38-63	33-42

REPRESENTATIVE BACKGROUND SOUND LEVELS

A statistical analysis of the daytime and night-time background sound levels is shown respectively. From the histograms the representative background sound levels are 43 dB $L_{A90,1hour}$ during the day and 34 dB $L_{A90,15min}$ at night.

ASSESSMENT OF AIR CONDITIONING PLANT

Cumulative noise emissions from the new proposed plant at both proposed new houses have been predicted at the nearest residential properties to the site and compared with the criteria in London Borough of Camden Planning Condition 11 for the development. In addition, it is appropriate to assess the noise from the plant serving each of the new dwellings on the other (i.e. to assess the effect of plant serving 6A Nutley Terrace on 6B Nutley Terrace, and vice versa).

PLANT LOCATIONS

The proposed locations of the new plant at the two dwellings are shown in the figure below.

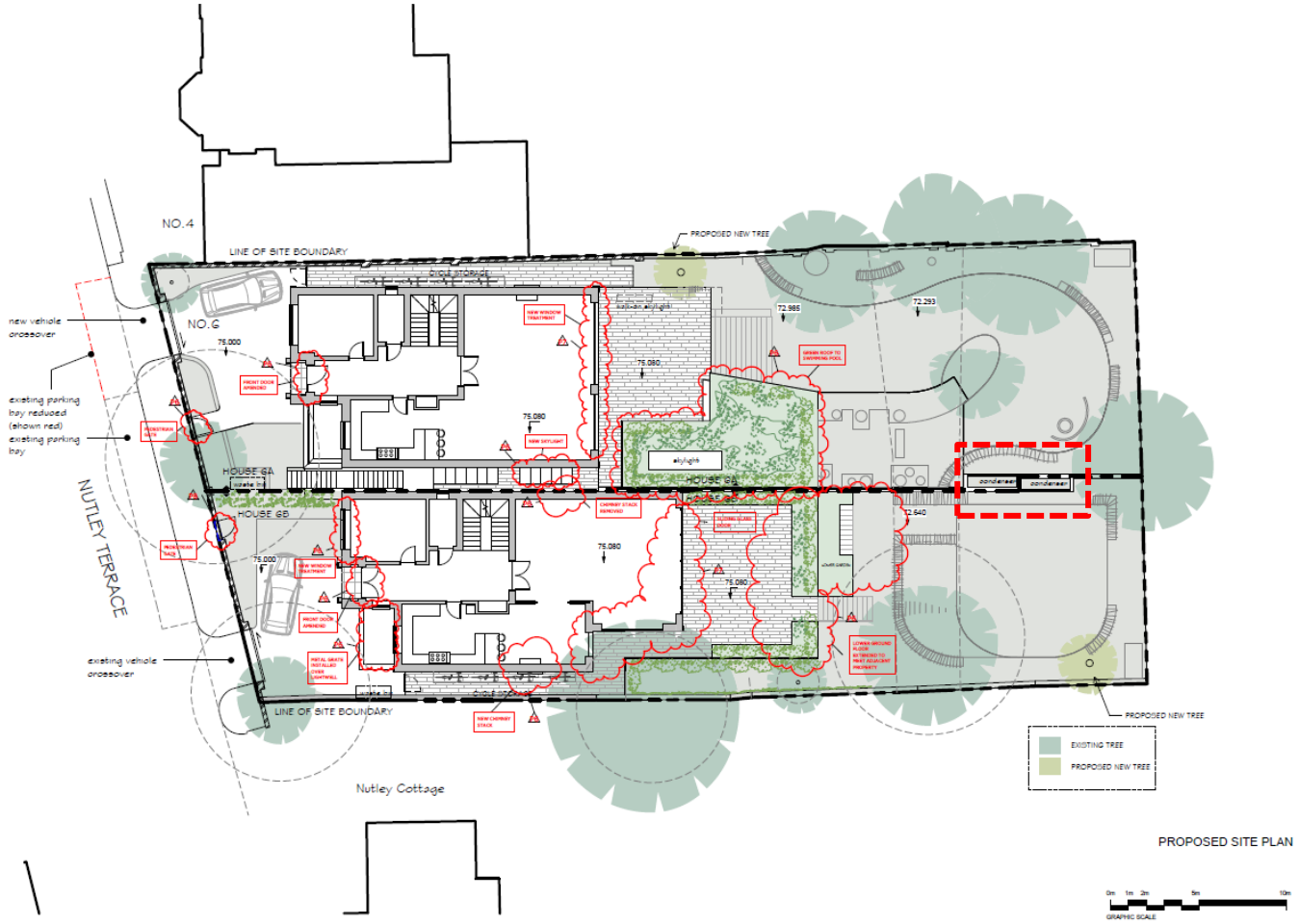


Figure 3: Location of external plant

NEAREST NOISE-SENSITIVE RECEPTORS

The noise-sensitive receptors closest to the proposed plant locations are:

- **Receptor R1:** Rear of houses to the west of the site, on Fitzjohn's Avenue. The nearest windows are approximately 22m from the plant location
- **Receptor R2:** Rear of houses to the east of the site, on Daleham Gardens. The nearest windows are approximately 25m from the plant location
- **Receptor R3:** Rear of 6A Nutley Terrace. The nearest windows are approximately 21m from the plant at 6B Nutley Terrace
- **Receptor R4:** Rear of 6B Nutley Terrace. The nearest windows are approximately 16m from the plant at 6A Nutley Terrace

CALCULATION OF NOISE LEVEL AT RECEPTORS

The manufacturer's sound pressure level data for the plant are shown in Table 5.

Table 5: Plant schedule and manufacturer's sound data

Location/Area Served	Manufacturer / Model	Sound pressure level
6A Nutley Terrace		
REAR GARDEN/HABITABLE ROOMS IN LGF & GF	Daikin/RXYSQ8TY1	55dBA
REAR GARDEN/AV RACK ROOM	Daikin /RZQG71L9V1	48dBA
6B Nutley Terrace		
REAR GARDEN/WHOLE HOUSE COOLING	Daikin/RXYSQ10TY1	55dBA
REAR GARDEN/WHOLE HOUSE COOLING	Daikin/RXYSQ10TY1	55dBA
REAR GARDEN/AV RACK ROOM	Daikin/RZQG71L9V1	48dBA

For each item of plant, and assuming propagation as a point source, the reduction in sound due to distance is given by:

$$20 \log r_a/r_m \text{ dB}$$

where

r_a is the distance from the sound source to the assessment location (m)

r_m is the reference distance from the sound source within the manufacturer's data (1m)

In addition, corrections must be made for surface directivity (where the plant is installed close to an acoustically reflective wall), screening (where the plant is not visible from the receptor(s) being considered) and any other attenuation provided (for example by acoustic treatment, if necessary).

The resultant sound pressure level at each receptor, due to each item of plant, is combined to give the cumulative sound pressure level. These calculations are shown in Table 6 to Table 9.

In practice, it is unlikely that all items of plant serving each dwelling operate at the same time, since cooling would not be required when both heating units are needed. However, it has been assumed in this assessment that all four units at both properties may run at any time, day or night. This offers a robust assessment, in accordance with London Borough of Camden's typical requirements.

The calculations include the effect of acoustic screening such that no plant is visible from any of the adjacent noise-sensitive premises. Typically, the required screening could be provided by a solid, close-boarded timber fence around the plant area, to a height at least 300mm above the top of the tallest unit; however, an acoustic enclosure, which is commonly a more expensive solution may also provide the same level of screening; an acoustic enclosure is commonly understood to provide a greater level of sound reduction than a screen. Calculations are made to a location 1m from the façade of the receptor in each case.

Table 6: Plant sound pressure levels at Receptor R1

Plant Item	dBA	At (m)	Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	dB(A)
6A Nutley Terrace							
Daikin/RXYSQ8TY1	55	1	21	-26	3	-11	21
Daikin /RZQG71L9V1	48	1	21	-26	3	-11	14
6B Nutley Terrace							
Daikin/RXYSQ10TY1	55	1	21	-26	3	-11	21
Daikin/RXYSQ10TY1	55	1	21	-26	3	-11	21
Daikin/RZQG71L9V1	48	1	21	-26	3	-11	14
						Cumulative sound pressure level	26

Table 7: Plant sound pressure levels at Receptor R2

Plant Item	dBA	At (m)	Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	dB(A)
6A Nutley Terrace							
Daikin/RXYSQ8TY1	55	1	24	-28	3	-11	19
Daikin /RZQG71L9V1	48	1	24	-28	3	-11	12
6B Nutley Terrace							
Daikin/RXYSQ10TY1	55	1	24	-28	3	-11	19
Daikin/RXYSQ10TY1	55	1	24	-28	3	-11	19
Daikin/RZQG71L9V1	48	1	24	-28	3	-11	12
						Cumulative sound pressure level	25

Table 8: Plant sound pressure levels at Receptor R3

Plant Item	dBA	At (m)	Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	dB(A)
6A Nutley Terrace							
Daikin/RXYSQ8TY1	Not applicable						
Daikin /RZQG71L9V1							
6B Nutley Terrace							
Daikin/RXYSQ10TY1	55	1	20	-26	3	-11	21
Daikin/RXYSQ10TY1	55	1	20	-26	3	-11	21
Daikin/RZQG71L9V1	48	1	20	-26	3	-11	14
						Cumulative sound pressure level	24

Table 9: Plant sound pressure levels at Receptor R4

Plant Item	dBA	At (m)	Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	dB(A)
6A Nutley Terrace							
Daikin/RXYSQ8TY1	55	1	15	-24	3	-11	23
Daikin /RZQG71L9V1	48	1	15	-24	3	-11	16
6B Nutley Terrace							
Daikin/RXYSQ10TY1	Not applicable						
Daikin/RXYSQ10TY1							
Daikin/RZQG71L9V1							
						Cumulative sound pressure level	24

ASSESSMENT AGAINST LONDON BOROUGH OF CAMDEN CRITERIA

Condition 11 requires that plant noise levels "at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement … unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps) …".

The plant proposed is not anticipated to exhibit any tonal or impulsive characteristics.

A comparison of the sound pressure levels calculated above, against the London Borough of Camden's requirements, are shown in Table 10

Table 10: Summary of plant noise calculations

Receptor	Period	Predicted noise level at Receptor, dB(A)	Representative Background sound level, dB L_{A90}	Planning Condition 11 Criterion, dB(A)	Difference, dB(A)
R1	Daytime (07:00-23:00)	26	43	38	-12
	Night-time (23:00-07:00)	26	34	29	-3
R2	Daytime (07:00-23:00)	25	43	38	-13
	Night-time (23:00-07:00)	25	34	29	-4
R3	Daytime (07:00-23:00)	24	43	38	-14
	Night-time (23:00-07:00)	24	34	29	-5
R4	Daytime (07:00-23:00)	24	43	38	-14
	Night-time (23:00-07:00)	24	34	29	-5

CONCLUSION

An environmental noise survey has been undertaken at 6 Nutley Terrace, London, to determine the representative background sound level at the nearest noise-sensitive premises.

The noise levels from proposed new plant to be installed at the nearest noise-sensitive receptors has been calculated and compared with the requirements in London Borough of Camden's Planning Condition 11.

NOISE IMPACT ASSESSMENT

The assessment shows that, with attenuation provided by screening between the proposed plant and the nearest windows, plant noise levels at 1m from the nearest residential premises are at least 5 dBA below the background sound level and therefore meet the requirements of Planning Condition 11.

This report, in conjunction with design drawings, manufacturer's data sheets and appropriate commitments to install and maintain the plant and attenuation, demonstrates compliance with Conditions 11 and 12.

APPENDIX A

Table 11. Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near (LAeq,T).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), LAx	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
LAeq,T	A noise level index called the equivalent continuous noise level over the time period 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.
Lmax,T	A noise level index defined as the maximum noise level recorded during a noise event with a period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L10,T	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. LA10,18h is the A –weighted arithmetic average of the 18 hourly LA10,1h values from 06:00-24:00.

APPENDIX B

Table 12. Results of environmental noise measurements

Date & time	L_{Aeq} [dB]	L_{AFmax} [dB]	L_{A10} [dB]	L_{A90} [dB]
23 April 2018				
11:30:02	49.1	65.5	49.7	43.4
11:45:02	47.8	70.2	48.5	42.6
12:00:02	44.9	58.1	46.6	42.7
12:15:02	45.7	59.1	47.3	42.9
12:30:02	62.4	75.5	69.6	43.7
12:45:02	57.7	75.3	62.3	44.3
13:00:02	48.3	68.2	48.5	43.1
13:15:02	47.8	60.5	50.1	43.8
13:30:02	45.6	61.8	47.5	42.7
13:45:02	44.8	56.7	46.7	42.1
14:00:02	45.0	63.2	46.8	42.2
14:15:02	45.8	59.6	47.9	42.8
14:30:02	55.0	62.1	56.8	43.8
14:45:02	49.7	59.6	55.9	43.0
15:00:02	48.6	67.6	48.0	43.2
15:15:02	47.2	66.7	47.6	43.1
15:30:02	53.3	74.9	49.5	43.2
15:45:02	57.9	79.9	62.6	44.1
16:00:02	45.7	64.6	47.5	42.6
16:15:02	46.8	64.5	48.1	42.5
16:30:02	45.6	62.8	47.6	42.8
16:45:02	45.8	61.0	47.7	42.9
17:00:02	45.5	64.2	47.1	42.6
17:15:02	44.9	56.9	46.3	42.8
17:30:02	45.2	54.0	46.9	43.0
17:45:02	46.2	56.5	48.0	43.7
18:00:02	46.0	63.0	47.3	43.2
18:15:02	46.8	60.9	48.9	43.4
18:30:02	47.1	58.2	49.2	44.1
18:45:02	46.7	60.0	48.2	44.4
19:00:02	46.6	54.1	48.1	44.6
19:15:02	47.6	62.1	49.4	43.7
19:30:02	46.0	55.9	48.0	43.0
19:45:02	45.9	59.8	47.5	42.9
20:00:02	46.5	57.3	49.4	42.2

Date & time	L_{Aeq} [dB]	L_{AFmax} [dB]	L_{A10} [dB]	L_{A90} [dB]
20:15:02	46.9	60.6	48.8	43.7
20:30:02	53.6	71.7	55.4	42.9
20:45:02	45.9	64.6	46.6	42.1
21:00:02	45.2	61.0	46.9	42.0
21:15:02	46.5	67.8	48.5	42.7
21:30:02	44.4	62.8	46.0	41.7
21:45:02	44.7	58.6	46.7	41.6
22:00:02	46.6	71.9	46.1	41.4
22:15:02	43.2	50.2	45.1	40.6
22:30:02	47.0	67.7	49.5	40.8
22:45:02	42.9	50.0	44.9	40.6
23:00:02	43.5	55.7	45.8	39.7
23:15:02	41.8	53.2	43.8	38.9
23:30:02	42.1	51.0	44.3	39.1
23:45:02	41.7	55.9	43.9	38.8
24 April 2018				
00:00:02	41.7	48.1	44.0	38.7
00:15:02	42.9	61.6	44.3	38.8
00:30:02	44.8	56.3	47.6	39.9
00:45:02	43.1	56.2	46.3	37.6
01:00:02	42.0	52.8	44.8	37.8
01:15:02	44.3	60.4	42.9	36.3
01:30:02	39.5	54.0	41.3	36.1
01:45:02	37.3	45.2	39.8	34.5
02:00:02	47.4	67.5	42.2	34.9
02:15:02	37.5	46.4	40.3	34.4
02:30:02	36.6	51.9	38.5	33.7
02:45:02	35.9	48.6	37.9	33.2
03:00:02	36.5	46.9	38.6	33.6
03:15:02	40.1	58.6	39.9	34.2
03:30:02	41.8	59.7	44.3	34.5
03:45:02	38.5	55.1	40.6	34.6
04:00:02	37.7	49.0	40.3	34.6
04:15:02	37.7	50.6	39.8	35.2
04:30:02	39.9	52.7	42.6	35.6
04:45:02	46.6	69.6	45.9	37.1
05:00:02	57.8	71.6	63.0	40.8
05:15:02	54.2	71.1	57.2	39.9
05:30:02	47.2	59.8	51.5	37.9

Date & time	L_{Aeq} [dB]	L_{AFmax} [dB]	L_{A10} [dB]	L_{A90} [dB]
05:45:02	47.8	64.0	51.0	39.6
06:00:02	46.8	60.8	50.7	39.5
06:15:02	46.3	62.2	49.1	40.0
06:30:02	46.2	59.1	48.7	41.8
06:45:02	47.7	64.6	48.8	41.5
07:00:02	47.0	61.5	48.7	42.5
07:15:02	47.0	58.6	49.1	42.7
07:30:02	46.5	63.6	47.6	42.5
07:45:02	46.2	64.0	48.0	42.8
08:00:02	45.6	60.2	47.0	42.0
08:15:02	47.6	61.8	50.4	42.5
08:30:02	48.8	62.7	52.5	42.9
08:45:02	48.1	65.5	49.8	42.6
09:00:02	48.7	66.1	51.1	42.8
09:15:02	46.3	59.4	48.1	43.4
09:30:02	47.0	62.8	48.3	43.1
09:45:02	46.8	66.3	47.5	42.9
10:00:02	48.3	62.5	49.5	43.2
10:15:02	47.7	66.0	48.5	42.2
10:30:02	51.6	68.6	53.9	43.0
10:45:02	49.2	68.7	51.6	42.8
11:00:02	46.1	65.8	47.5	42.6
11:15:02	47.5	59.2	50.7	43.2
11:30:02	46.8	62.8	48.0	42.6
11:45:02	46.3	59.9	48.5	42.6
12:00:02	47.6	70.4	46.7	42.3
12:15:02	45.5	60.1	47.1	43.2
12:30:02	55.2	75.9	52.7	43.1
12:45:02	46.1	58.6	48.4	42.6
13:00:02	49.4	71.6	50.3	43.5
13:15:02	46.0	66.0	47.2	43.9
13:30:02	47.5	66.4	49.0	44.2
13:45:02	47.8	61.9	49.0	44.9
14:00:02	47.7	60.5	49.2	45.6

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