

**9 Wadham Gardens
London
NW3 3DN**

**Environmental Noise Survey
and Plant Noise Assessment Report**

28866/PNA1

24 August 2022

For:
Carnell Warren Associates



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Document Control

Rev	Date	Comment	Prepared by	Authorised by
1	24/08/2022	Correct the local council's requirement		
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1.0 Introduction

New external plant items are proposed at 9 Wadham Gardens NW3 3DN.

Hann Tucker Associates have therefore been commissioned to undertake a detailed Environmental Noise Survey at the site and to propose suitable plant noise emission criteria based on the requirements of the Local Authority.

An assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive window.

This report presents the survey methodology and findings.

2.0 Objectives

To inspect the site to familiarise ourselves with its layout and surroundings in order to identify suitable accessible locations for environmental noise measurements.

To establish by means of an unmanned 24 hour survey the existing L_{Amax} , L_{Aeq} and L_{A90} environmental road, rail and air traffic noise levels at one secure and accessible on-site position, using fully computerised noise monitoring equipment.

The survey will enable noise emission limits from the development to be identified with reference to the requirements of the Local Authority and/or the application of BS 4142: 2014 and to minimise the possibility of noise nuisance to neighbours.

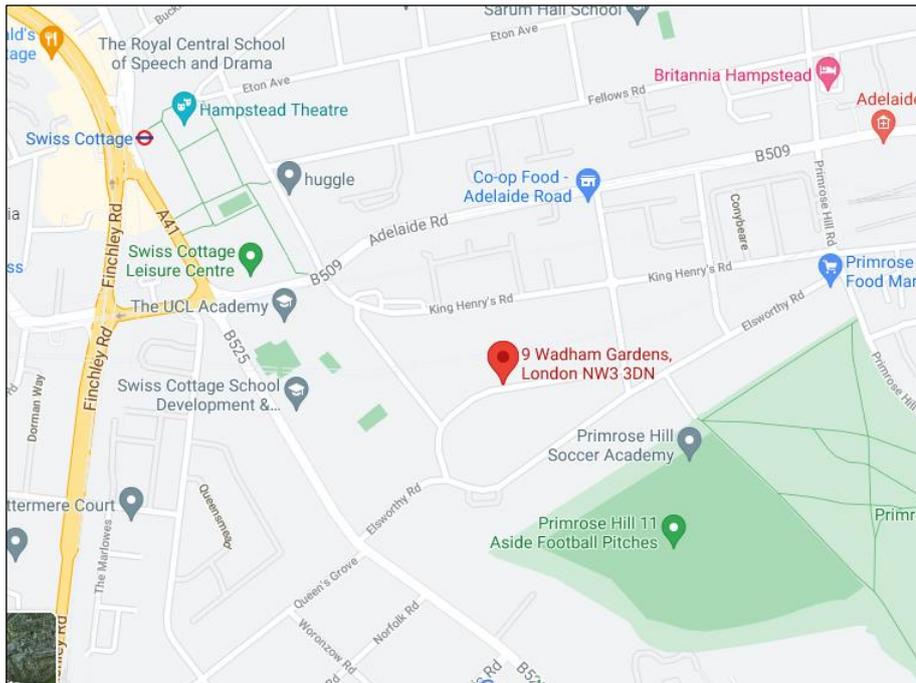
To assess the noise emissions from the proposed plant, based upon data with which we are provided, and comment upon the acceptability.

To advise on noise control measures if required with reference to the requirements of the Local Authority.

3.0 Site Description

3.1 Location

The site is located at 9 Wadham Gardens, NW3 3DN. The location is shown in the Location Map below.

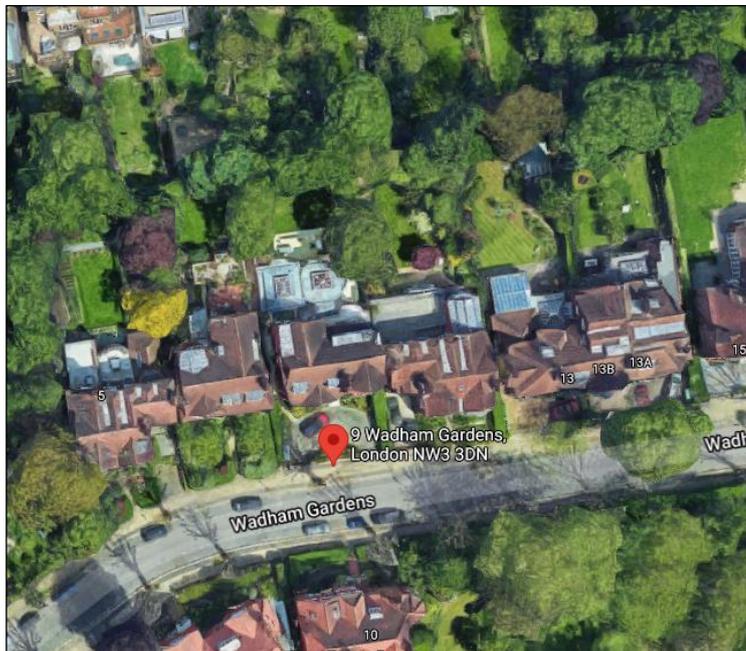


Location Map (Map Data © 2021 Google)

The site falls within the jurisdiction of London Borough of Camden.

3.2 Description

The site is 3-storey detached house located at north of Wadham Gardens. The nearby buildings are predominantly residential properties. The site is shown in the Site Plan below:



Site Plan (Map Data © 2021 Google)



4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Acoustic Standards and Guidelines

5.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010 (i.e. before the NPPF). The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

“Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.”

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

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

The Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

None of these three levels are defined numerically and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and



the time of day/day of the week, etc. The need for more research to investigate what may represent an SOAEL for noise is acknowledged in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three NPSE noise policy aims listed above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *“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.”* The final aim envisages proactive management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.

5.2 National Planning Policy Framework (NPPF)

The following paragraphs are from the NPPF (revised February 2019):

“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;

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.

182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation



before the development has been completed.”

Paragraph 180 also references the Noise Policy Statement for England. This document does not refer to specific noise levels but instead sets out three aims:

“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.

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

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.”

5.3 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at <http://planningguidance.planningportal.gov.uk/blog/guidance/>. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of examples of outcomes as set out in the following table:

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.	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 hard, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

5.4 Local Authority Requirements

The site lies within the jurisdiction of London Borough of Camden. Their advice regarding criteria for atmospheric noise emissions from building service plant is as follows:

5.4.1 Noise Sensitive Developments

The LB of Camden determines in Policy A4 of their Camden Local Plan (2017) that a noise sensitive development is that which, "...includes housing, schools and hospitals as well as offices, workshops and open spaces..."

5.4.2 Building Services Plant Noise Criteria

The site lies within the jurisdiction of the London Borough of Camden. Their policy stated within the *Camden Local Plan (2017)* regarding criteria for atmospheric noise emissions from building service plant is as follows:

"Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)



Existing Noise Sensitive Receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings	Garden used for main amenity (free-field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings	Outside bedroom window (façade)	Night	Rating level' 10dB* below background and no events exceeding 57dBLAmax	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB LAmax	Rating 'Rating level' greater than 5dB above background and/or events exceeding 88dBLAmax

5.5 BS 4142:2014

When setting plant noise emission criteria reference is commonly made to BS 4142: 2014 *“Methods for rating and assessing industrial and commercial sound”*.

The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains “a tone, impulse or other characteristic” then various corrections can be added to the specific (source) noise level to obtain the “rating level”.

BS 4142 states that: *“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 estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:

- *“Typically, the greater this difference, the greater the magnitude of the impact.”*
- *“A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.”*
- *“A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.”*



- “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.”

The determination of the “rating level” and the “background level” are both open to interpretation, depending on the context.

In summary it is not possible to set plant noise emission criteria purely on the basis of BS 4142:2014. It is reasonable to infer from the above, however, that a difference of around -5dB corresponds to “No Observed Effect Level” as defined in the Noise Policy Statement for England. It is also reasonable to infer from the above that if the plant noise rating level does not exceed the existing background noise level outside any noise sensitive residential window then the plant noise is of “low impact”.

5.6 World Health Organisation Guidelines on Community Noise

BS8233:2014 is based upon the current World Health Organisation (WHO) guidance “Guidelines on Community Noise”. A summary of the noise guidelines relevant to the proposed scheme is presented in the table below.

Residential Environment	Critical Health Effect(s)	L _{Aeq}	L _{AFmax}	Time Base
Outdoor living area	Serious annoyance, daytime and evening	55	-	07:00-23:00
	Moderate annoyance, daytime and evening	50	-	07:00-23:00
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	-	07:00-23:00
Inside bedrooms	Sleep disturbance, night-time	30	45	23:00-07:00
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	60	23:00-07:00

These WHO guidelines are based, in almost all cases, on the lower threshold below which the occurrence rates of any particular effect can be assumed to be negligible.

5.7 British Standard BS8233: 2014

British Standard 8233: 2014 “Guidance on sound insulation and noise reduction for



buildings” provides guidance for the control of noise in and around buildings.

BS8233:2014 Section 7.7.2 titled “Internal ambient noise levels for dwellings” states:

“In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 - 23:00	23:00 - 07:00
Resting	Living Rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

5.8 Statutory Noise Nuisance

There is no quantitative definition of statutory noise nuisance. It is generally accepted however, that if the plant noise level is at least 5dB (or 10dB if tonal) below the minimum background $L_{90(15minutes)}$ at 1m from the nearest noise sensitive residential window, then the risk of a statutory noise nuisance is avoided. By adopting this as a design criterion the guidance contained in BS 4142:2014 should also be complied with.

6.0 Survey Methodology

The survey was undertaken by Bo Ding, Consultant AMIOA.

6.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 12:00 hours on Wednesday 5th May 2021 to 12:00 hours on Thursday 6th May 2021.

During the periods we were on site the wind conditions were calm. The sky was generally clear. We understand that generally throughout the survey period the weather conditions were similar. These conditions are considered suitable for obtaining representative measurement results.

Measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound pressure levels over 15 minute periods.



6.2 Measurement Position

The microphone was located at the back garden of the property and approximately 1.5 metres above roof level.



Plan Showing Measurement Position (Map Data © 2021 Google)

6.2.1 Instrumentation

The instrumentation used during the survey is presented in the Table below:

Description	Manufacturer	Type	Serial Number	Calibration
Type 1 ½" Condenser Microphone	PCB	377A02	101926	Calibration on 29/06/2020
Preamp	Larson Davis	PRM902	3949	Calibration on 29/06/2020
Type 1 Data Logging Sound Level Meter	Larson Davis	824	3701	Calibration on 29/06/2020

The sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.1dB).

The sound level meter was located in an environmental case with the microphone connected



to the sound level meter via an extension cable.

The microphone was fitted with a windshield.

7.0 Results

The results have been plotted on Time History Graphs 28866/TH1 enclosed, presenting the 15 minute A-weighted (dBA) L_{90} and L_{eq} noise levels at each measurement position throughout the duration of the survey.

The measured L_{Aeq} and $L_{A90(15\text{ min})}$ during the survey are presented in the tables below:

Measured L_{eq} Noise Level (dB re 2×10^{-5} Pa)		
Daytime (07:00 – 19:00 hours)	Evening (19:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
53	49	46

Lowest Measured $L_{A90(15\text{ min})}$ Background Noise Level (dB re 2×10^{-5} Pa)		
Daytime (07:00 – 19:00 hours)	Evening (19:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
37	36	33

8.0 Discussion Of Noise Climate

During the periods we were on site the dominant noise source was noted to be road traffic noise.

9.0 Plant Noise Emission Criteria

On the basis of the above and the results of the environmental noise survey, we propose the following plant noise emission criteria be achieved at 1 metre from the nearest noise sensitive residential window.

plant noise emission criteria (dB re 2×10^{-5} Pa)		
Daytime (07:00 – 19:00 hours)	Evening (19:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
27	26	23

It should be noted that the above are subject to the final approval of the Local Authority.



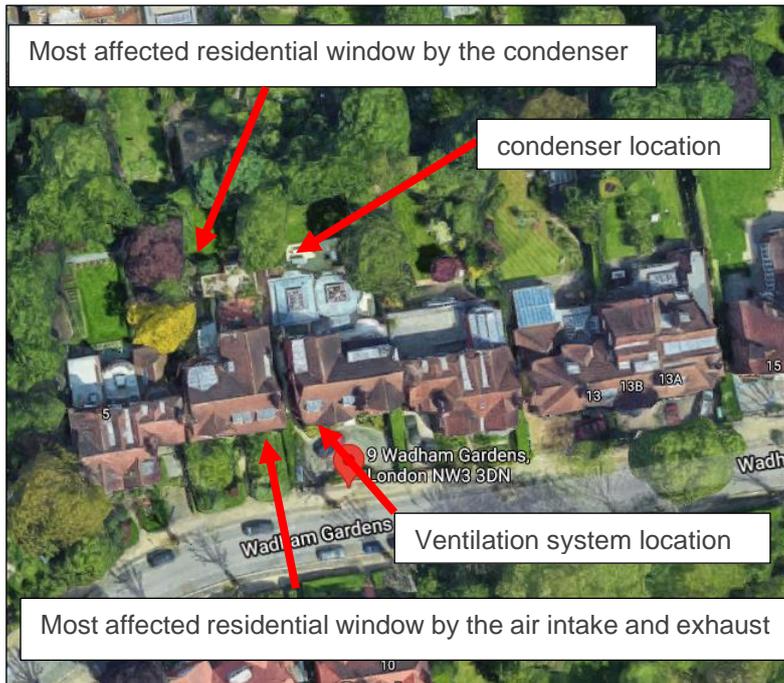
10.0 Plant Noise Impact Assessment

We understand the proposed plant consists of a Daikin condenser (RXYSCQ5TV1) and a pool ventilation system (Phoenix EC 3000 Super Plus).

10.1 Location of Plant

The condenser is proposed to be located at the back garden. The ventilation system is proposed to be located the basement plant room at front of the property.

The location of the plant and the nearest residential window is shown below:



Plan showing plant location

10.2 Plant Noise Data

We understand the manufacturer's noise data for the equipment to be as follows:

Plant Description	Sound Pressure Level (dB re 2x10 ⁻⁵ Pa) at 1 metre at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
RXYSCQ5TV1	51	53	52	53	47	41	34	27	53



Plant Description	Sound Power Level (dB re 2x10 ⁻¹² Watts) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Phoenix EC 3000 Super Plus Fresh Air Intake	65.6	66.2	63.8	64.5	61.7	63.4	60.9	52.4	68.9
Phoenix EC 3000 Super Plus Air Exhaust	67.7	69.5	67.7	69.1	66.3	68.1	65.3	56.0	73.5

10.3 Mitigation Measures

In order to control plant noise emissions in line with the proposed criterion, we recommend:

- acoustic enclosure is installed for the proposed RXYSCQ5TV1. The specification of the enclosure is attached.
- in-duct attenuator is installed for air intake and air exhaust of Phoenix EC 3000. The required minimum insertion loss is shown in below table:

Description	Required Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Attenuator for fresh air intake	7	12	20	33	39	40	35	28
Attenuator for air exhaust	7	12	20	33	39	40	35	28

10.4 Plant Noise Impact Assessment

We understand that the proposed plant will be operational during daytime and night-time.

The following tables summarise our calculations of atmospheric noise emissions from the plant to the nearest residential window.



Noise from Daikin Condenser

	Sound Pressure Level (dBA)
Sound Pressure Level at 1m of the condenser with acoustic enclosure	34@ 1 m
Distance Correction	-14
Façade Reflection	+3
Calculated Noise Level at Receptor	23

Our calculations indicate that the proposed plant, in conjunction with our recommended mitigation measures, should be capable of achieving the requirements of the Local Authority outlined in Section 9.0.

Noise from Phoenix EC 3000

	Sound Pressure Level (dBA)
Calculated Sound Pressure Level at Receptor with In-duct Attenuator Based on Our In-house Software (Air intake)	14
Calculated Sound Pressure Level at Receptor In-duct Attenuator Based on Our In-house Software (Air exhaust)	18
Façade Reflection	+3
Cumulative Sound Pressure Level at Receptor	23

Our calculations indicate that the proposed plant, in conjunction with our recommended mitigation measures, should be capable of achieving the requirements of the Local Authority outlined in Section 9.0.

11.0 Conclusions

An environmental noise survey has been undertaken in order to establish the currently prevailing noise levels.



Plant noise emission criteria have been recommended based on the results of the noise survey and with reference to the Local Authority's requirements

An assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive windows.

The assessment indicates that the proposed plant, in conjunction with our recommended attenuation, should be capable of achieving the proposed environmental noise criteria at the nearest residential and commercial windows.

Appendix A

The acoustic terms used in this report are defined as follows:

dB Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dB_A The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dB_A. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dB_A do not have a linear relationship to each other; for similar noises, a change in noise level of 10dB_A represents a doubling or halving of subjective loudness. A change of 3dB_A is just perceptible.

L_{90,T} L₉₀ is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

L_{eq,T} L_{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Sound Pressure Level (L_p) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

Sound Power Level (SWL or L_w) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

SPECIFICATION FOR ACOUSTIC ENCLOSURE

The condenser unit shall be supplied complete with acoustic treatment which shall achieve adequate levels of attenuation to ensure that the following limiting sound pressure levels are not exceeded when measured at a distance of 1m (free field over a reflecting plane) under any load conditions.

Plant Item	A-weighted Limiting Sound Pressure Level @ 1m (dB re 2×10^{-5} Pa)
Daikin condenser (RXYSCQ5TV1)	34

Furthermore they shall not exhibit any significant tonal content.

Exceedances in excess of the measurement tolerance for a Type 1 sound level meter shall constitute a failure.

The enclosed outer panels shall be constructed from galvanized sheet steel having a minimum thickness of 1.6mm and fixed at 300mm (max) centres. The enclosure inner panels shall be constructed from punch-perforated (round-hole) galvanised sheet steel facing, having a minimum thickness of 0.7mm fixed at 300mm (max) centres. Flattened-expanded ("Expamet") sheet shall not be used, unless all edges of the sheet are mechanically fixed to the panel casing and galvanised steel cover strips are used to prevent rivet heads pulling through the perforated sheet (trapping the Expamet between two solid steel layers).

The inert, rot and vermin proof, non-hygroscopic and non-combustible mineral wool or glass fibre acoustic medium shall be packed to a density of not less than 48kg/m^3 . This shall be faced with a glass fibre cloth, or other approved infill protection membrane. Panels shall be constructed and assembled so that no egress of the acoustic medium will occur under the operating conditions.

Doors, access panels, windows and ventilation ducts or electrical cable penetrations shall be treated so as to maintain the specified acoustic insulation of the assembled enclosure.

Demountable sections shall be designed to allow easy disassembly and reassembly by unskilled personnel without affecting the acoustic performance.

The supplier shall ensure that the assembled enclosure is designed and constructed to withstand site operating conditions such as wind and snow loads, roof mounted plant, etc., as appropriate, and if outside, to be suitably weatherproofed.

The acoustic media shall not comprise materials which are generally composed of mineral fibres, either man made or naturally occurring, which have a diameter of 3 microns or less and a length of 200 microns or less or which contain any fibres not sealed or otherwise stabilised to ensure that fibre migration is prevented.

Any deviations from the above specification must be agreed by, and confirmed in writing to, Hann Tucker Associates

9 Wadham Gardens

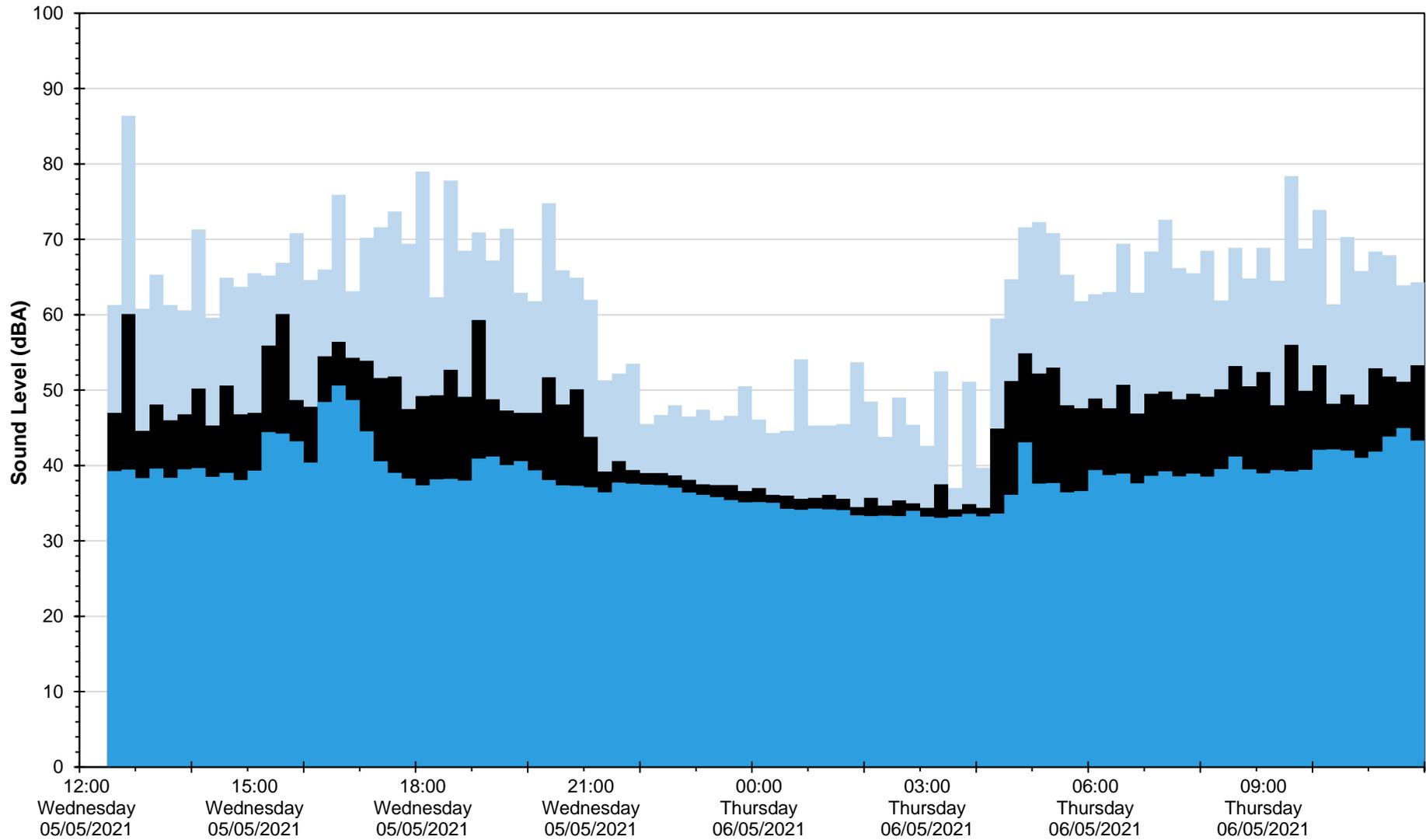
back garden

L_{eq} , L_{max} and L_{90} Noise Levels

Wednesday 5 May 2021 to Thursday 6 May 2021

■ L_{max} ■ L_{eq}

■ L_{90}



Date and Time

28866/TH1