Pho

18 Greenwich Church Street
Greenwich
London
SE10 9BJ

Plant Noise Impact Assessment

On behalf of

Pho

Project Reference: 92238 | Revision: 00 | Date: 28th March 2024

T: 01252 519881
W: noisesolutions.co.uk
E: hello@noisesolutions.co.uk
Noise Solutions Ltd, Unit 5, Oriel Court, Omega Park, Alton, GU34 2YT Reg no. 3483481

Document Information

Project Name	:	**Pho, Greenwich**
Project Reference	:	**92238**
Report Title	:	**Noise Impact Assessment**
Doc Reference	:	**92238/NIA**
Date	:	**28h March 2024**

	Name	Qualifications	Initials	Date
Prepared by:	Adam Meakins	AMIOA	ACM	28th March 2024
Reviewed and approved by:	Nigel Chandler	BSc(Hons), MIOA	NAC	28th March 2024
For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/ Approved

Reg no. 3483481 Trading office Unit 5, Oriel Court, Omega Park, Alton, Hampshire, GU34 2YT

Contents

Appendices

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Pho to provide a Noise Impact Assessment for new plant serving a proposed Pho restaurant located in No18 Greenwich Church Street in Greenwich.

1.2. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.

1.3. The cumulative plant noise level has been predicted at the nearest noise-sensitive receptors and assessed against recognised standards.

1.4. A glossary of acoustic terminology is given in **Appendix A**. An in-depth glossary of acoustic terms can be viewed online at www.acoustic-glossary.co.uk.

2.0 Details of development proposals

2.1. The Pho restaurant is to be located in the basement and ground floor at No18 Greenwich Church Street in Greenwich.

2.2. New refrigeration plant will be located externally on the roof of the building. Ventilation plant comprising a supply AHU and a kitchen extract fan will be installed on the roof. Two existing air conditioning (AC) units will be relocated also on the roof.

2.3. All plant will run only during the operational period 07.00 hours to 23.00 hours, with the exception of the catering condensing unit which will run constantly.

3.0 Nearest noise sensitive receptors

3.1. The area surrounding the site is mixed residential and commercial in nature. The nearest noise sensitive properties will be the residential dwelling above the restaurant (Receptor R1), approximately 3m from the nearest plant, and the residential dwelling above the adjacent property at No 17 Greenwich Church Street (Receptor R2), approximately 8m from the nearest plant.

3.2. **Appendix B** contains an aerial photograph showing the site and surrounding area, including the locations of the potential receptor identified above.

4.0 Existing noise climate

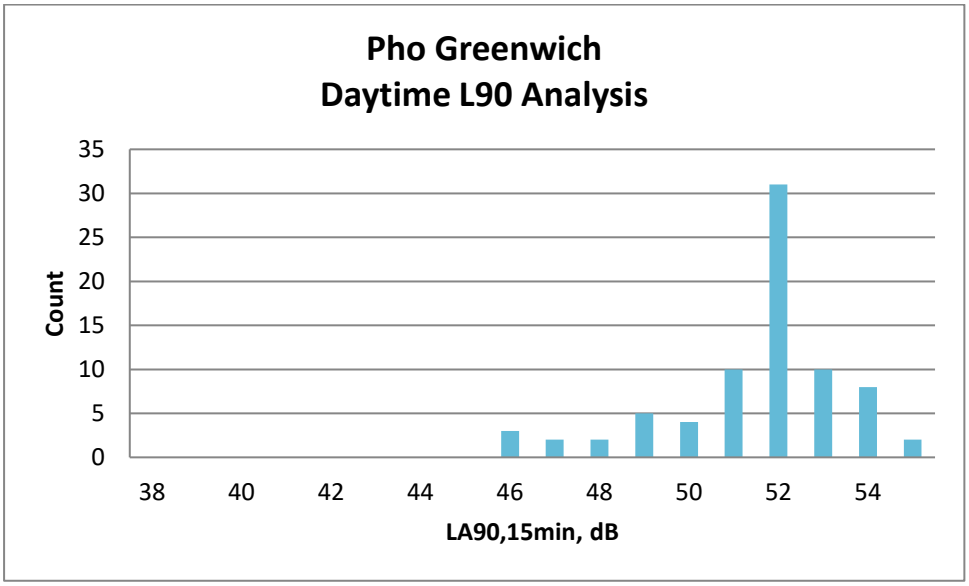
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

4.2. The results of the environmental sound survey are summarised in Table 1 below. The full set of measurement results and details of the survey methodology are presented in **Appendix C**.

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime hours (07.00 – 23.00 hours)	55-65	64-86	57-68	46-55
Night-time hours (23.00 – 07.00 hours)	51-60	62-82	55-61	38-53

Figure 1 Histogram of daytime hours L_{A90} background sound pressure levels



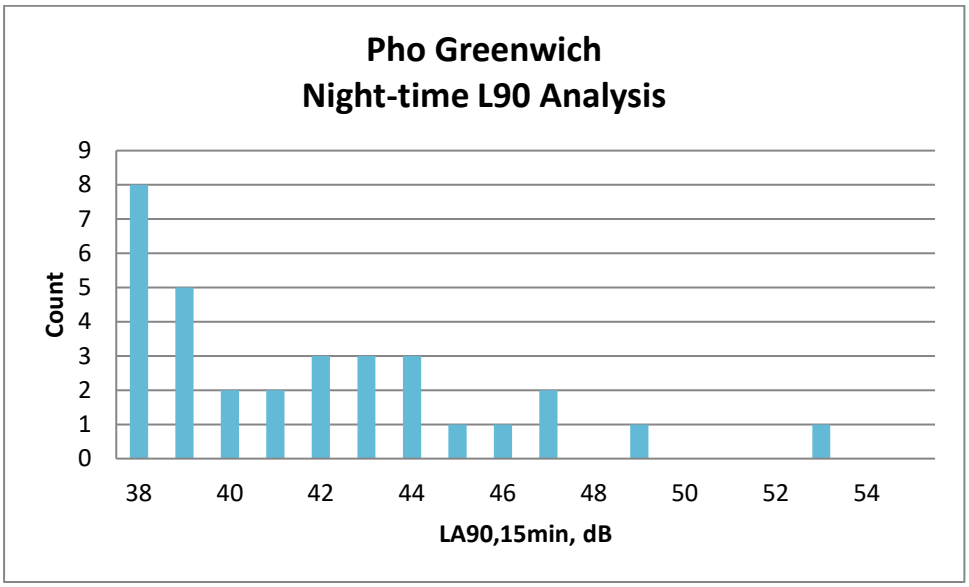
4.3. Further statistical analysis has been carried out on the data, and the mean and median values are shown in Table 2 below.

Table 2 Statistical analysis of $L_{A90,15min}$ levels during daytime hours

dB, L_{A90} daytime period	
Mean	51
Mode	52
Median	52

4.4. From the histogram analysis, 49dB has been selected to be a robust representation of the background noise level during the daytime hours, at the survey location.

Figure 2 Histogram of night-time hours L_{A90} background sound pressure levels



4.5. Further statistical analysis has been carried out on the data and the mean and median values are shown in Table 3 below.

Table 3 Statistical analysis of $L_{A90,15min}$ levels during the night-time hours

dB, L_{A90} night-time period	
Mean	42
Mode	38
Median	41

4.6. Again, from the histogram analysis, 38dB has been chosen to be representative of the background sound level at the survey location, during the night-time hours.

4.7. The following values are considered representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 49dB L_{A90} during the daytime hours; and
- 38dB L_{A90} during the night-time hours.

5.0 Plant noise design criteria

National Planning Policy Framework

5.1. A new edition of the NPPF was published in December 2023 and came into effect immediately. The original National Planning Policy Framework (NPPF[1]) was published in March 2012, with subsequent revisions made periodically - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The December 2023 revised edition contains no new directions or guidance with respect to noise. The paragraph references quoted below relate to the December 2023 edition.

5.2. Paragraph 180 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing 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 instability."*

5.3. The NPPF goes on to state in Paragraph 191:

"planning policies and decisions 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 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 ...

5.4. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE[2]).

5.5. Paragraph 2 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."*

[1] National Planning Policy Framework, DCLG, March 2012
[2] Noise Policy Statement for England, DEFRA, March 2010

5.6. Paragraph 12 of the NPPF states that *"The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed"*.

5.7. Paragraph 123 states that *"Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land"*.

Royal Borough of Greenwich

5.8. Royal Borough of Greenwich Council usually require that:

> *"Prior to the commencement of works on the development hereby permitted, an acoustic report shall be submitted to and approved by the Local Planning Authority. The noise from any plant or equipment such as air handling units, boilers, lifts, mechanical ventilation etc which forms part of the development shall not cause the existing background noise level to increase when measured at one metre from the façade of the nearest noise sensitive premises. In order to achieve this, the plant shall be designed/selected, or the noise from the plant should be attenuated, so that it is 10dB below the existing background level ($L_{A90\ 15min}$). The approved scheme shall be implemented prior to occupation of the development and shall be permanently maintained thereafter. The developer shall certify to the local planning authority that the noise mitigation measures agreed have been installed."*

BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

5.9. BS 4142:2014+A1:2019 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014+A1:2019 includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.

5.10. The procedure contained in BS 4142:2014+A1:2019 is to quantify the *"specific sound level"*, which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07.00 to 23.00 hours, and night-time as 23.00 to 07.00 hours.

5.11. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.

5.12. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: *"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."*

5.13. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: *"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."*

5.14. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

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

5.15. The standard does state that "*adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."*

5.16. The standard goes on to note that: *"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."*

5.17. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

"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 assessments and arriving at decisions, therefore, it is essential to place the sound in context."

5.18. BS 4142:2014+A1:2019 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

Proposed criteria

5.19. In accordance with the Royal Borough of Greenwich Council's typical requirements it is proposed that the plant sound level should be at least 10dB below the existing representative background sound level at any nearby noise sensitive receptor. The following plant noise limits are therefore proposed:

Table 4 Plant noise emissions limits at the receptor boundary

Receptor	Period	Cumulative plant sound level, dB(A)
Residential	Daytime hours (07.00 – 23.00 hours)	39
	Night-time hours (23.00 – 07.00 hours)	28

6.0 External plant noise assessment

6.1. The cumulative plant noise level at the most affected noise sensitive receptors has been predicted. The assessment has taken into consideration distance attenuation and directivity corrections. Predictions are inclusive of the following atmospheric-side attenuators fitted to the ventilation systems:

Table 5 Proposed atmospheric side attenuators to ventilation system

Attenuator	Insertion losses dB, at octave band centre frequencies (Hz)							
	63	125	250	500	1k	2k	4k	8k
Supply (AHU1) – atmospheric	5	9	16	28	35	35	32	26
Kitchen Extract (EF1) – atmospheric	5	11	21	30	38	32	23	13

6.2. The predictions are inclusive of an acoustic enclosure around the kitchen extract fan case providing a minimum 10dB sound reduction.

6.3. The predictions are also inclusive of an acoustic enclosure around the condensing units providing a minimum 22dB sound reduction.

6.4. It should be noted that the proposed ventilation plant will operate during operational hours only and is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed external plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems.

6.5. Table 6, below, summarises the results of the assessment at the nearest receptor. All other receptors benefit from increased distance/screening to the plant. The full set of calculations can be found in **Appendix E**. The predictions between 07.00 and 23.00 hours have been based on the proposed plant operating simultaneously at full capacity. The refrigeration plant only will operate between 23.00 and 07.00 hours.

Table 6 Assessment of predicted noise levels at nearest receptors

Receptor	Period	Predicted sound level at receptor, L_{Aeq} (dB)	Proposed design criterion (dB)	Difference (dB)
R1	Daytime hours (07.00 – 23.00 hours)	39	39	0
	Night-time hours (10.00 – 23.00 hours)	28	28	0
R2	Daytime hours (07.00 – 23.00 hours)	37	39	-2
	Night-time hours (10.00 – 23.00 hours)	22	28	-6

6.6. The above assessment demonstrates that noise from the proposed plant will result in noise levels below the proposed limits and should therefore be acceptable to the local authority.

Context and uncertainties

6.7. As BS 4142:2014+A1:2019 advises, the impact must be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:

- The assessment is undertaken at the nearest residential windows. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.

6.8. Where possible uncertainty in the above assessments has been minimised by taking the following steps:

- The meter and calibrator used have a traceable laboratory calibration and the meter was field

calibrated before and after the measurements.

- Uncertainty in the calculated impacts has been reduced by the use of a well-established calculation method.

7.0 Summary

7.1. Noise Solutions Ltd (NSL) has been commissioned by Pho to provide a Noise Impact Assessment for new plant serving a proposed Pho restaurant located in No18 Greenwich Church Street in Greenwich.

7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area.

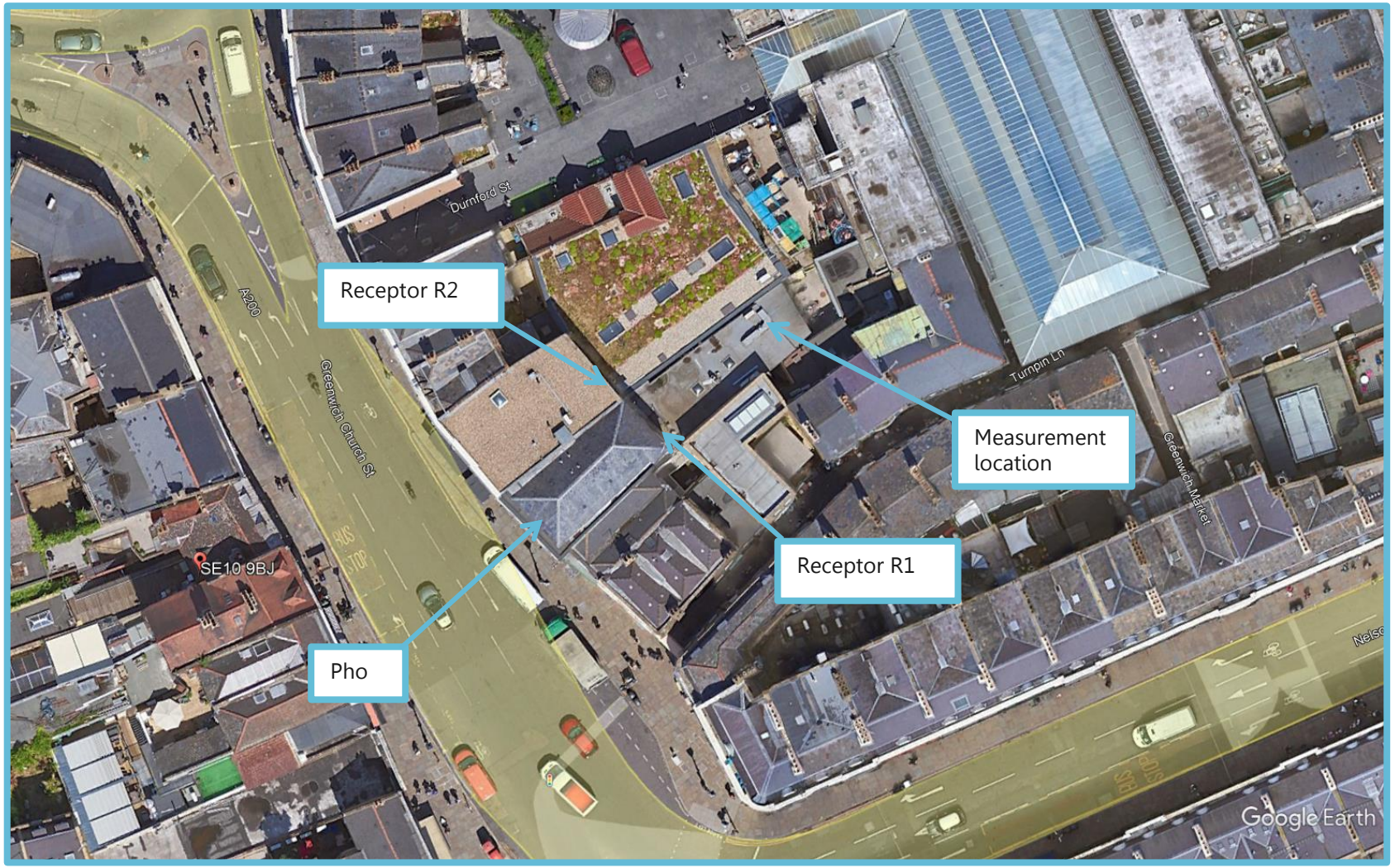
7.3. Cumulative plant noise emission levels for the proposed plant have been predicted, inclusive of the specified mitigation measures, at the most affected noise sensitive receptors and assessed using the typical requirements of the Royal Borough of Greenwich Council.

7.4. Therefore, noise from the proposals should not be a reason for refusal of planning permission.

Appendix A 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 ($L_{Aeq,T}$).
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 $\log_{10}$ (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), L_{Ax}	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.
$L_{Aeq,T}$	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.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

Appendix B Aerial photograph of site showing areas of interest



Aerial image © Google 2024

Appendix C Environmental sound survey

Details of environmental sound survey

C.1 Measurements of the existing background sound levels were undertaken between 10.00 hours on Wednesday 20th March and 13.15 hours on Thursday 21st March 2024.

C.2 The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive fifteen-minute sample periods for the duration of the survey.

Measurement position

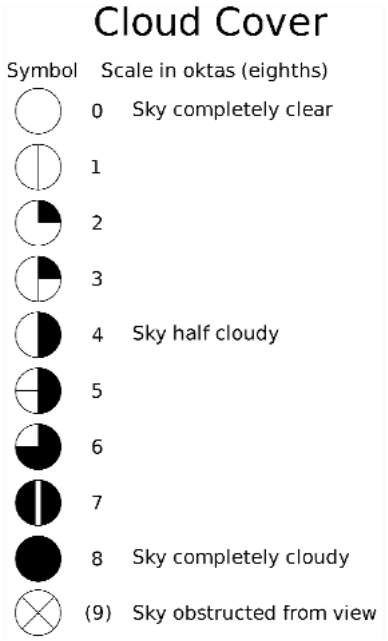
C.3 The sound level meter was positioned on the roof of the building, close to the nearest noise sensitive receptors. The approximate location of the microphone is indicated on the photograph in **Appendix B**. In accordance with BS 7445-2:1991 *'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*, the measurements were undertaken under free-field conditions.

Equipment

C.4 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

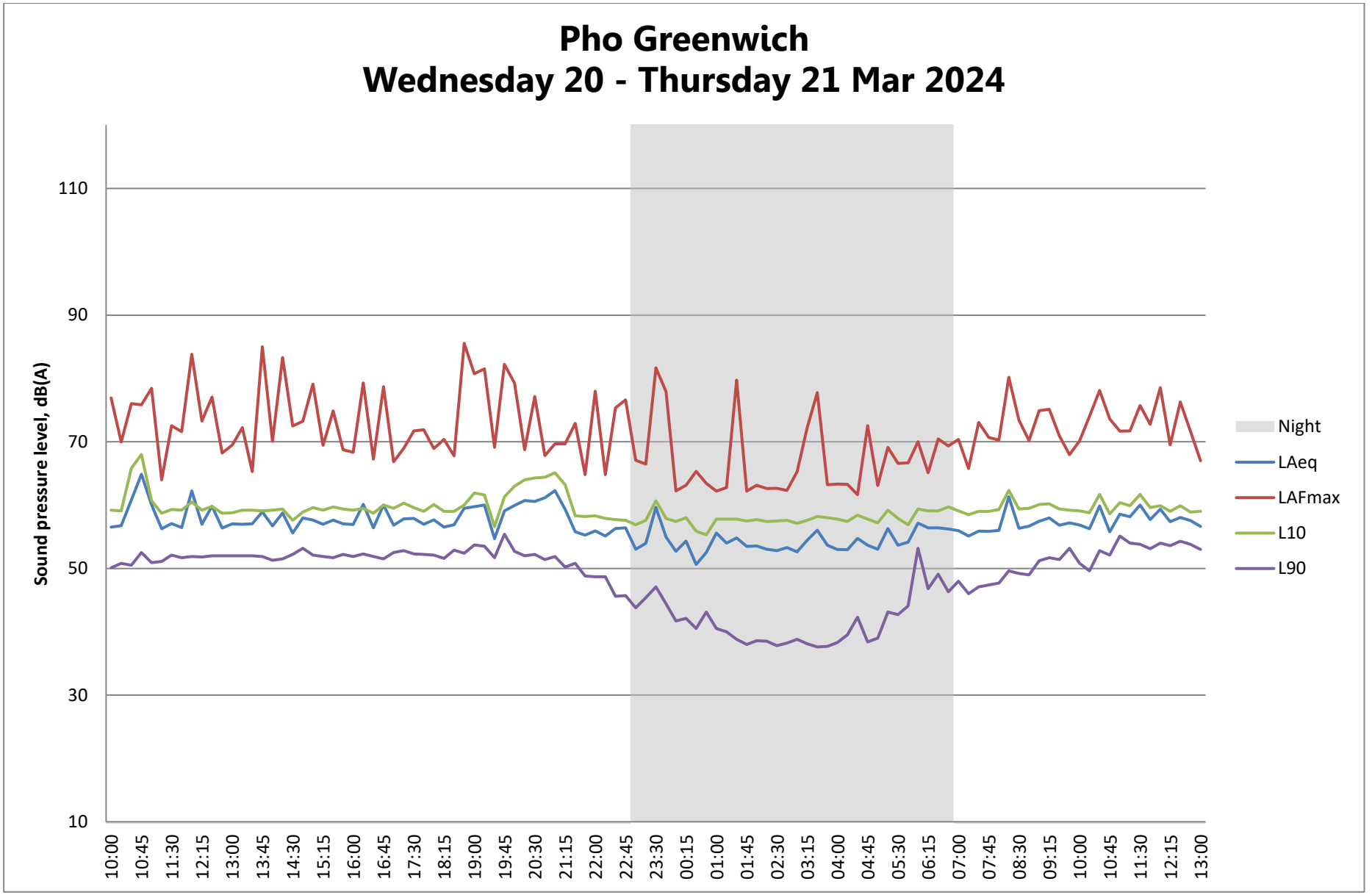
Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977/ 97446	16/01/2023	1504305-1
Condenser microphone	Microtech MK255 / 20194		
Preamplifier	Svantek SV12L / 106487		
Calibrator	Svantek SV 30A / 10847	01/06/2023	1505421-1

C.5 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. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	**Time/Date**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	10.00 20/3/24 - 13.15 21/3/24	Temperature (°C)	13	15
		Precipitation:	Yes	No
		Cloud cover (oktas – see guide)	5	7
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Yes	No
		Wind Speed (m/s)	1	1
		Wind Direction	Southerly	Northerly
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

C.6 The results of the survey are considered to be representative of the background sound pressure levels at the façade of the most affected noise sensitive receptor to the plant area during the quietest times at which the plant will operate. The noise climate at the measurement position during the installation and collection of the monitoring equipment was dominated by local road traffic and plant servicing adjacent properties. The results of the survey are presented in a time history graph overleaf.


Pho Greenwich
Wednesday 20 - Thursday 21 Mar 2024
Sound pressure level, dB(A)
110
90
70
50
30
10
10:00
10:45
11:30
12:15
13:00
13:45
14:30
15:15
16:00
16:45
17:30
18:15
19:00
19:45
20:30
21:15
22:00
22:45
23:30
00:15
01:00
01:45
02:30
03:15
04:00
04:45
05:30
06:15
07:00
07:45
08:30
09:15
10:00
10:45
11:30
12:15
13:00
Night
LAeq
LAFmax
L10
L90

Appendix D Equipment Manufacturer's Noise Data

Reference	Make / Model	No. units	Notes	Sound levels, dB, at octave band frequencies (Hz)								
				63	125	250	500	1K	2K	4K	8K	L_{Aeq} (dB)
AHU1	Systemair/MUB/100 630 Multibox	1	Inlet L_w	84	87	83	79	77	73	69	64	82
			Case breakout L_w	**66**	**77**	**68**	**51**	**50**	**46**	**40**	**31**	**64**
EF1	Helios/Gigabox 710/4/4	1	Discharge L_w	87	87	82	86	84	80	72	64	88
			Case breakout L_w	83	83	77	61	56	52	47	42	**71**
AC1-2	Mitsubishi/PUZ-M140	2	L_p at 1m									54 at 1 m
CC1	FCS HTF 50 3PH SP HOUSED	1	L_p at 10m									41 at 10 m

Appendix E Predicted Noise Levels Calculation

AHU1 vent

NSL Ref: **92238**
Project **Pho Greenwich**

Compiled by:	ACM	28/03/2024

Plant Ref **AHU1**
Plant Description **Systemair/MUB/100 630 Multibox**

Description	Notes.	Sound level (dB) at octave band centre frequencies (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)	In-duct L_w	84	87	83	79	77	73	69	64	**82**
System losses		-5	-2	0	0	0	0	0	0	
Atmospheric side attenuator	I.L.	-5	-9	-16	-28	-35	-35	-32	-26	
Sound power level leaving terminal		**74**	**76**	**67**	**51**	**42**	**38**	**37**	**38**	**63**

Receptor R1	V angle	H angle										
Directivity correction	0	180	1000 x 1000 (0,180)	-2	-3	-7	-9	-8	-8	-8	-8	
Distance correction	14	m	14 m	-31	-31	-31	-31	-31	-31	-31	-31	
Screening correction	Screened:		δ=	-14	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R1				L_p	**41**	**42**	**29**	**11**	**3**	**-1**	**-2**	**-1**	**27**

Receptor R2	V angle	H angle										
Directivity correction	0	180	1000 x 1000 (0,180)	-2	-3	-7	-9	-8	-8	-8	-8	
Distance correction	15	m	15 m	-32	-32	-32	-32	-32	-32	-32	-32	
Screening correction	Screened:		δ=	-15	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R2				L_p	**40**	**41**	**28**	**10**	**2**	**-2**	**-3**	**-2**	**26**

AHU1 case

NSL Ref: **92238**
Project **Pho Greenwich**

Compiled by:	ACM	28/03/2024

Plant Ref **AHU1 case**
Plant Description **Systemair/MUB/100 630 Multibox**

				Sound level (dB) at octave band centre frequencies (Hz)								
				63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)	Sound Power Level			66	77	68	51	50	46	40	31	**64**
Casing Lagging / Enclosure			I.L.	0	0	0	0	0	0	0	0	
Attenuated source noise level				**66**	**77**	**68**	**51**	**50**	**46**	**40**	**31**	**64**
Receptor R1												
Distance correction	11 m		11 m	-29	-29	-29	-29	-29	-29	-29	-29	
Screening correction	Screened:	δ=	-11	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R1			L_p	**37**	**48**	**39**	**22**	**21**	**17**	**11**	**2**	**35**
Receptor R2												
Distance correction	13 m		13 m	-30	-30	-30	-30	-30	-30	-30	-30	
Screening correction	Screened:	δ=	-13	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R2			L_p	**36**	**47**	**38**	**21**	**20**	**16**	**10**	**1**	**34**

EF1 vent

NSL Ref: **92238**
Project **Pho Greenwich**

Compiled by:	ACM	28/03/2024

Plant Ref **EF1**
Plant Description **Helios/Gigabox 710/4/4**

Description	Notes.	Sound level (dB) at octave band centre frequencies (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)	In-duct L_w	87	87	82	86	84	80	72	64	**88**
System losses		-8	-4	0	0	0	0	0	0	
Atmospheric side attenuator	I.L.	-5	-11	-21	-30	-38	-32	-23	-13	
Sound power level leaving terminal		**74**	**72**	**61**	**56**	**46**	**48**	**49**	**51**	**61**

Receptor R1	V angle	H angle										
Directivity correction	0	180	650 x 650 (0,180)	-1	-2	-3	-7	-9	-8	-8	-8	
Distance correction	12	m	12 m	-30	-30	-30	-30	-30	-30	-30	-30	
Screening correction	Screened:		δ= -12	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R1			**L_p**	**43**	**40**	**28**	**19**	**7**	**10**	**11**	**13**	**27**

Receptor R2	V angle	H angle										
Directivity correction	0	180	650 x 650 (0,180)	-1	-2	-3	-7	-9	-8	-8	-8	
Distance correction	13	m	13 m	-30	-30	-30	-30	-30	-30	-30	-30	
Screening correction	Screened:		δ= -13	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R2			**L_p**	**43**	**40**	**28**	**19**	**7**	**10**	**11**	**13**	**27**

EF1 case

NSL Ref: **92238**
Project **Pho Greenwich**

Plant Ref **EF1 case**
Plant Description **Helios/Gigabox 710/4/4**

Compiled by:	ACM	28/03/2024

				Sound level (dB) at octave band centre frequencies (Hz)								
				63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)	Sound Power Level			83	83	77	61	56	52	47	42	**71**
Casing Lagging / Enclosure			I.L.	10	10	10	10	10	10	10	10	
Attenuated source noise level				**73**	**73**	**67**	**51**	**46**	**42**	**37**	**32**	**61**
Receptor R1												
Distance correction	9	m	9 m	-27	-27	-27	-27	-27	-27	-27	-27	
Screening correction	Screened:	δ=	-9	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R1			L_p	**46**	**46**	**40**	**24**	**19**	**15**	**10**	**5**	**34**
Receptor R2												
Distance correction	11	m	11 m	-29	-29	-29	-29	-29	-29	-29	-29	
Screening correction	Screened:	δ=	-11	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R2			L_p	**44**	**44**	**38**	**22**	**17**	**13**	**8**	**3**	**32**

Condensers R1

Unit	Make / Model	L_{pA}	at / m	m	dB	Directivity	Screening	Attenuation	Result
CU1	Mitsubishi/PUZ-M140	54	1	3	-10	3	0	-20	27
CU2	Mitsubishi/PUZ-M140	54	1	4	-12	3	0	-20	25
CCU1	FCS HTF 50 3PH SP HOUSED	41	10	5	6	3	0	-22	28

Condensers R2

Unit	Make / Model	L_{pA}	at / m	m	dB	Directivity	Screening	Attenuation	Result
CU1	Mitsubishi/PUZ-M140	54	1	8	-18	3	0	-20	19
CU2	Mitsubishi/PUZ-M140	54	1	9	-19	3	0	-20	18
CCU1	FCS HTF 50 3PH SP HOUSED	41	10	10	0	3	0	-22	22

Cumulative plant noise levels at Receptor

	R1 dB(A)	R2 dB(A)
AHU1	27	26
EF1	27	27
AC1	27	19
AC2	25	18
CCU1	28	22
AHU1 case	35	34
EF1 case	34	32
Combined plant L_p (Daytime) All plant running	**39**	**37**
Combined plant L_p (Night-time) refrigeration plant running	**28**	**22**

Appendix F Restaurant Plant Layout