parkerjones acoustics

4 Frognal Parade

London, NW3 5HH

Noise Impact Assessment

11th May 2023

First Issue

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London, NW3 5HH

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Revision History

Version	Comments	Author	Date
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Executive Summary and Conclusions

This document, a Noise Impact Assessment (NIA) has been written to assess the risk of adverse impact from noise 'pollution' generated by proposals for a kitchen extract flue on the rear elevation of no. 4 Frognal Parade, London, NW3 5HH.

The assessment has been conducted by setting the maximum plant noise emissions against existing ambient noise levels at nearby noise-sensitive receptors – based on the condition typically applied by Camden Council that the rating noise level of the plant should not exceed the existing background sound level minus 10 dB when determined outside of residential windows (when the noise source is not tonal), determined in accordance with BS 4142:2014+A1:2019.

The existing background sound levels have been determined by conducting a baseline noise survey (Section 3.0) at the site, on the boundary close to the nearest neighbouring residential properties, finding a minimum daytime value of 50 dB $L_{A90,15min}$.

As a result, the maximum plant noise level at 1m outside of neighbouring residential properties is 40 dB L_{Aeq} during the day.

As per Section 5.0, it is seen that the predicted noise emissions outside the worst-affected neighbouring window are 35 dB, and therefore, compliant with the limit. That is, providing that the extract fan is designed to have sound power levels no greater than those in Table 5.3, and a silencer is installed on the atmospheric side which achieves the minimum insertion losses in Table 5.4. If a louder extract fan is required, then the performance of the silencer should also be increased accordingly.

The risk of structure-borne vibration/sound transfer will be negligible providing that anti-vibration fixings and rubber washings on screws/bolts are installed where the extract fan is fixed to the building structure or the suspension system. The steel ductwork should also be mounted using these fixings.

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1.0 Introduction

ParkerJones Acoustics Limited (PJA) has been instructed to undertake a Noise Impact Assessment to assess proposals for a kitchen extract flue on the rear elevation of no. 4 Frognal Parade, London, NW3 5HH.

This document has been written to assess the risk of adverse impact from noise 'pollution' generated by the extraction system ('the plant') on neighbouring residential properties.

The purpose of this report is to determine the representative background sound level outside of neighbouring residential properties; set appropriate noise level criteria based upon this pre-existing noise level in line with Local Planning Policy and demonstrate whether the plant has been designed and located to sufficiently mitigate noise levels to meet these noise level limits successfully – and if not, provide recommendations on how to mitigate the impact to an acceptable level.

This report takes into consideration the noise pollution related planning conditions that have been applied to other sites in the nearby area by the LPA (in this case Camden Council).

Whilst every attempt has been made to ensure that this report communicates effectively to a reader who might not have much knowledge of acoustics, some parts are necessarily technical. A glossary of acoustic terminology and concepts is provided in Appendix A.

2.0 Site and Development Description

The property in question is at 4 Frognal Parade, London, NW3 5HH, part of a terraced building with commercial use at ground floor level and residential above, as shown in Figure 2.1.

The proposals relate to the ground floor of no. 4, occupied by *Tonys Crepe*, a small fast food shop, and include the installation of a small kitchen extract system with a flue running up the rear elevation and terminating 1m above the eaves, as shown in Figures 2.2 and 2.3.

Figure 2.1 – Street view of the rear elevation

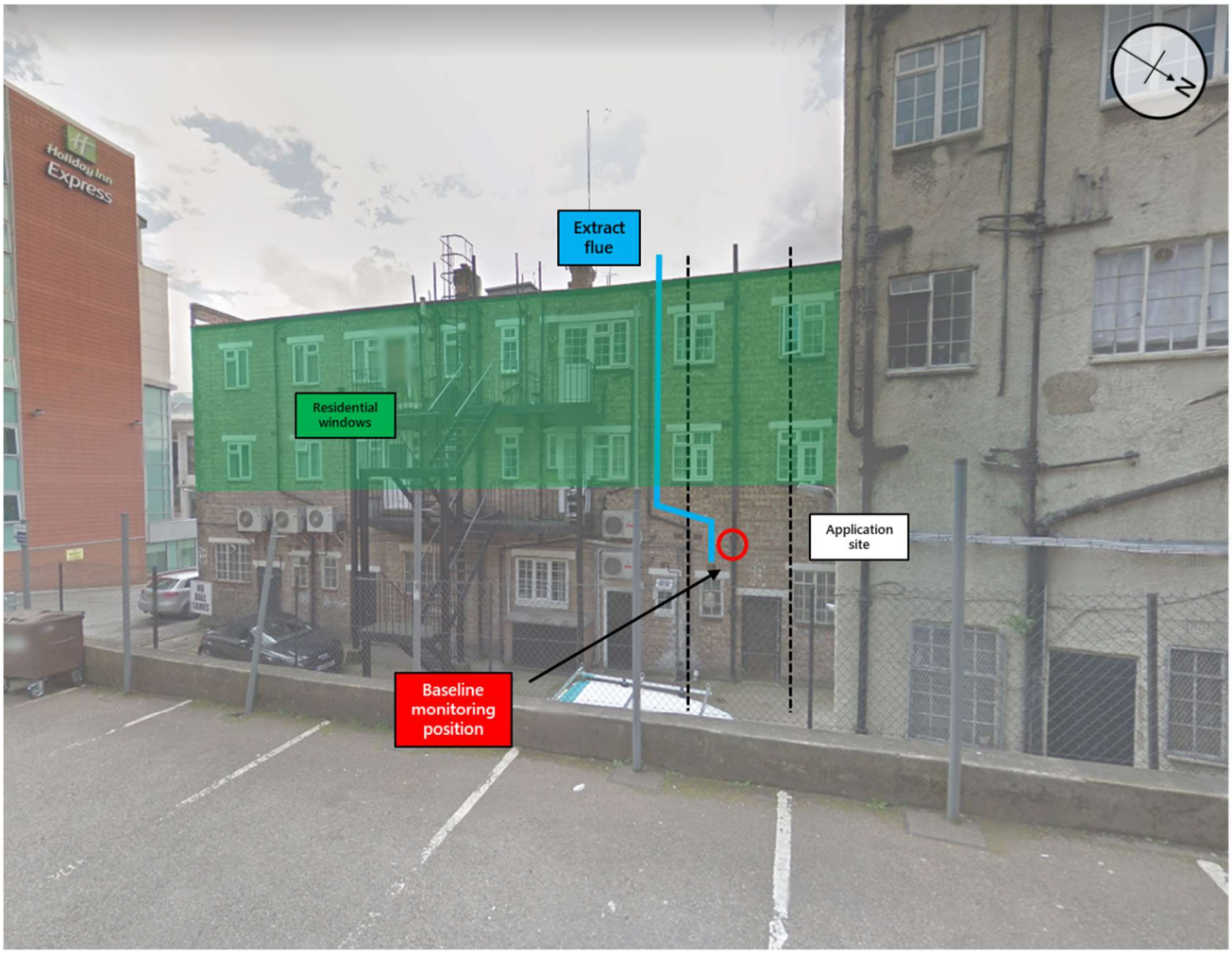
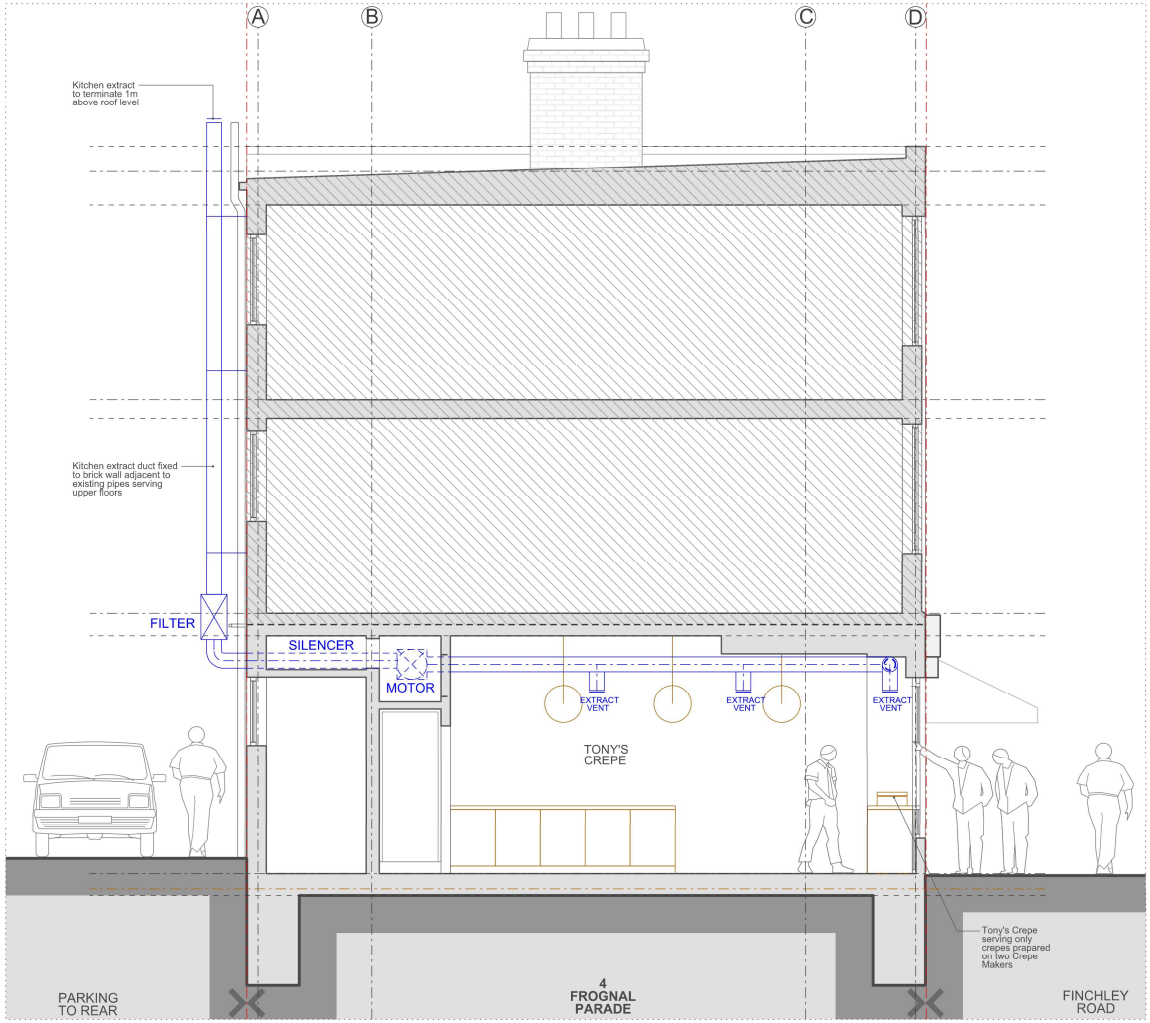


Figure 2.2 – Proposed section



SECTION A-A - PROPOSED
SCALE 1:50 @ A3

GENERAL NOTES:

This drawing is to be read in conjunction with all other relevant drawings, specifications and calculations.

All dimensions to be physically checked on site by the Contractor prior to commencement of any work, and/or preparation of any shop drawings.

Sizes of and dimensions to any structural elements are indicative only. See structural engineers drawings for actual sizes / dimensions.

Any discrepancies between information shown on this drawing and any other contract information or manufacturers / suppliers recommendations is to be brought to the attention of the Architect.

This drawing is prepared solely for design and planning submission purposes. It is not intended or suitable for either Building Regulations or Construction purposes and should not be used for such.

All dimensions are in mm unless noted otherwise.

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P1 - Issued for Planning Amendment — 28.03.2023 Date

Site Address:
4 Frognal Parade
LONDON NW3 5HH

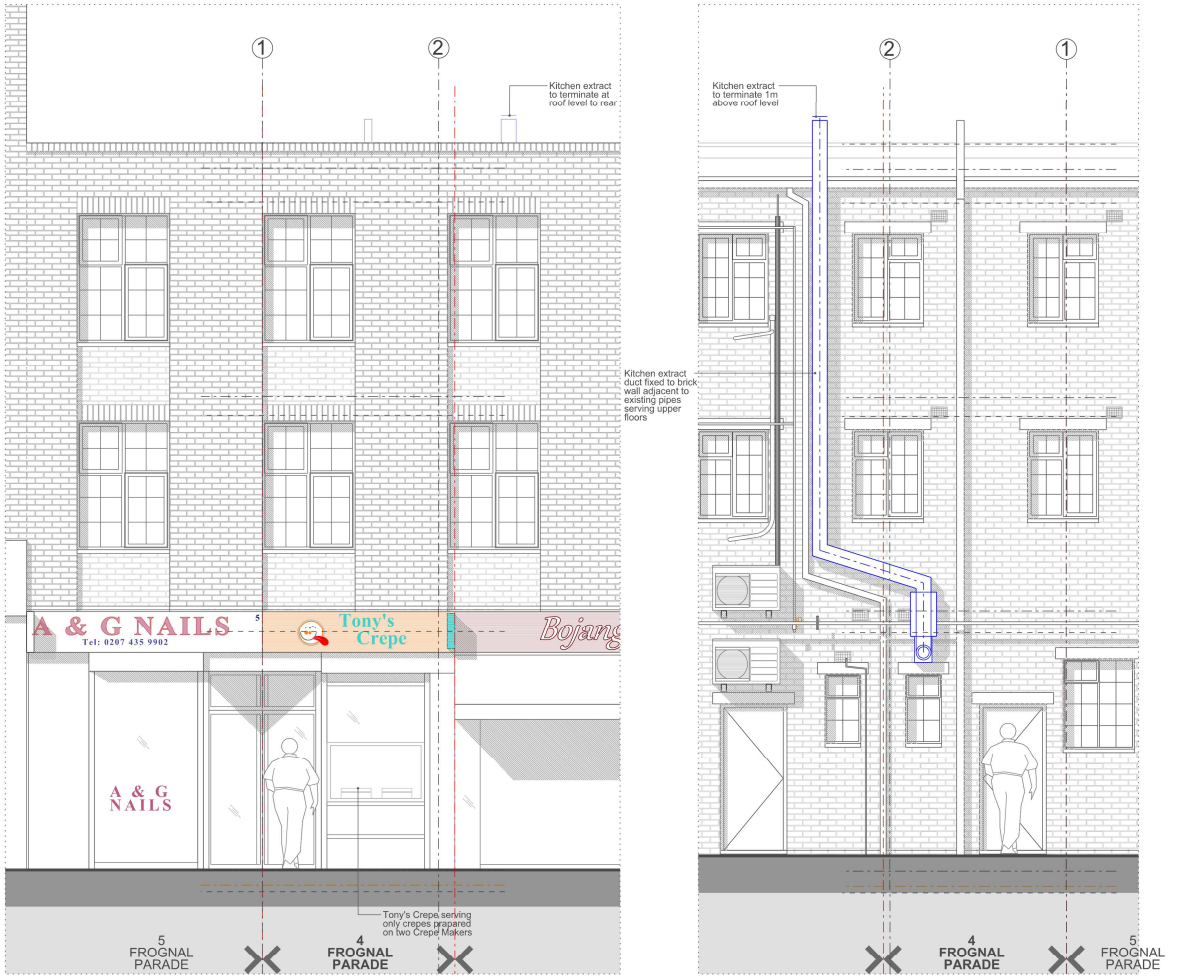
Job/Drawing No: 149-P-070 — Amendment: P1

SECTION A-A - PROPOSED

Scale : 1:25 (1:50 @ A3)
Date : 28.03.2023
Drawn: TT

Original printed at A1 — All dimensions to be checked on site

Figure 2.3 – Proposed elevations



3.0 Planning Policies and Guidelines

3.1 Local Authority Requirements

PJA note that planning applications for new air conditioning units (and plant in general) in the Camden Council area typically require the *rating noise level* from plant to be no greater than 10 dB below the *representative background sound level* and when determined at 1m outside of neighbouring noise-sensitive windows. If the source is tonal, as assessed according to BS 4142:2014+A1:2019, then it should be at least 15 dB below.

The following are typical conditions:

1) *The external noise level emitted from plant, machinery or equipment at the development hereby approved shall be lower than the lowest existing background noise level by at least 10dBA, by 15dBA where the source is tonal, as assessed according to BS4142:2014 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity.*

   Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policies G1, CC1, D1,and A1 of the London Borough of Camden Local Plan 2017.

2) *Prior to use, plant or equipment and ducting at the development shall be mounted with proprietary anti-vibration isolators and fan motors shall be vibration isolated from the casing and adequately silenced and maintained as such.*

   Reason: Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policies G1, CC1, D1,and A1 of the London Borough of Camden Local Plan 2017.

3.2 BS 4142:2014

BS 4142:2014 *'Methods for rating and assessing industrial and commercial sound'* is intended to be used to assess the potential adverse impact of sound of an industrial and/or commercial nature, at nearby noise-sensitive receptor (NSR) locations (i.e., residential windows) within the context of the existing sound environment.

The method is based upon assessing the predicted noise emissions from plant/equipment against the existing background sound levels at NSRs, the latter of which is determined by a noise survey conducted at the site.

The predicted noise emissions are termed as a 'rating level', which is the 'specific sound level' from plant (the actual measurable noise level), plus 'penalties' which account for whether the noise has distinguishing characteristics such as tonality, intermittency, impulsivity, or is generally distinguishable from the ambient noise environment. Such features may attract attention and be considered annoying, hence sounds with these qualities should be penalised over sounds at the same specific noise level which is less intrusive.

Appendix B.4 explains the methodology in further detail.

4.0 Baseline Noise Survey

4.1 Methodology

PJA has attended the site to conduct a baseline noise survey across a 24-hour period between Tuesday the 9th and Wednesday the 10th of May 2023. The results have been used to determine a representative background sound level at a position representative of nearby residential receptors.

A fixed monitoring position was employed with the microphone propped at a height of approx. 3.5m, 1m from the rear elevation façade, underneath the 1st floor residential windows above. The location of the monitoring position is also shown in Figure 2.1 (Section 2.0).

The sound level meter was set to log noise levels over continuous 15-minute averaging periods with a 1-second time history rate. The monitoring equipment was left unattended for the majority of the survey with the exception for a short period around the installation and collection of the equipment.

The following noise indices were recorded (amongst others):

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period T. This parameter is typically considered as a good representation of the average ambient sound level;
- $L_{AFmax,T}$: The maximum A-weighted noise level during the measurement period T and the best representation of short high noise levels 'events' – i.e., emergency services sirens; and
- $L_{A90,T}$: The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level' and is therefore used in determining the representative background noise level – or noise levels from continuous noise sources such as plant.

Appendix C contains further information on the methodology of the survey, including photographs taken from site and the equipment used.

4.2 Results

A graph of the measured noise levels across the monitoring period is given in Figure 4.1. Table 4.1 summarises the results across the daytime (07:00 – 23:00) period in which the extract fan would likely operate.

The most relevant parameter in terms of the 'representative background sound level' is the $L_{A90,15min}$. Figure 4.2 presents histograms of the $L_{A90,15min}$ values – showing minimum values of 50 dB in the daytime. PJA anticipates operating times for the fan of around 10:00 till 20:00, for which coincidentally, the minimum values of $L_{A90,15min}$ was again 50 dB.

Subjectively, the most dominant noise source was road traffic along Finchley Road. Two small condensers can be seen in photographs of the rear elevation, but these were not operational during the survey.

Table 4.1 – Summary of measured noise levels

Period	Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
Daytime (07:00 – 23:00)	$L_{Aeq,15min}$ (dB)	65	55	59	58	58	58
	$L_{AFMax,15min}$ (dB)	88	66	N/A	74	74	74
	$L_{A90,15min}$ (dB)	57	50	N/A	52	52	52

Figure 4.1 – Graph of measured noise levels

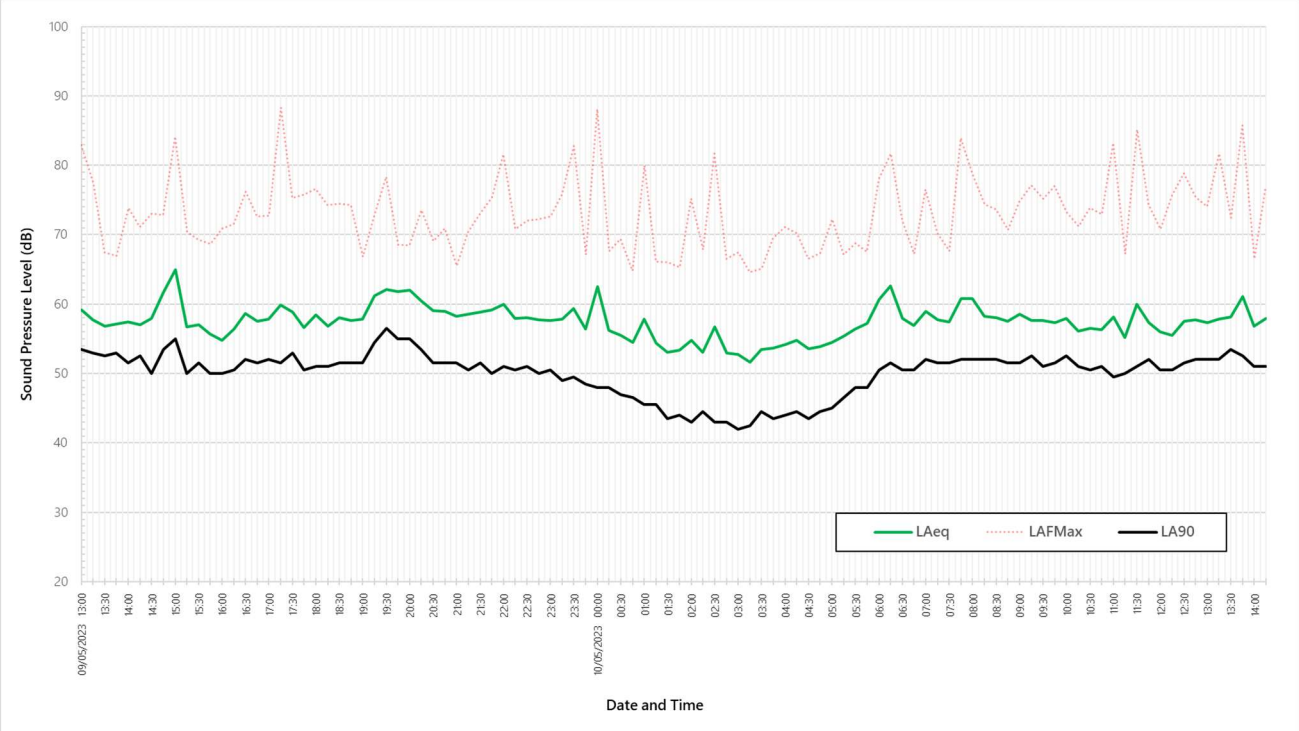
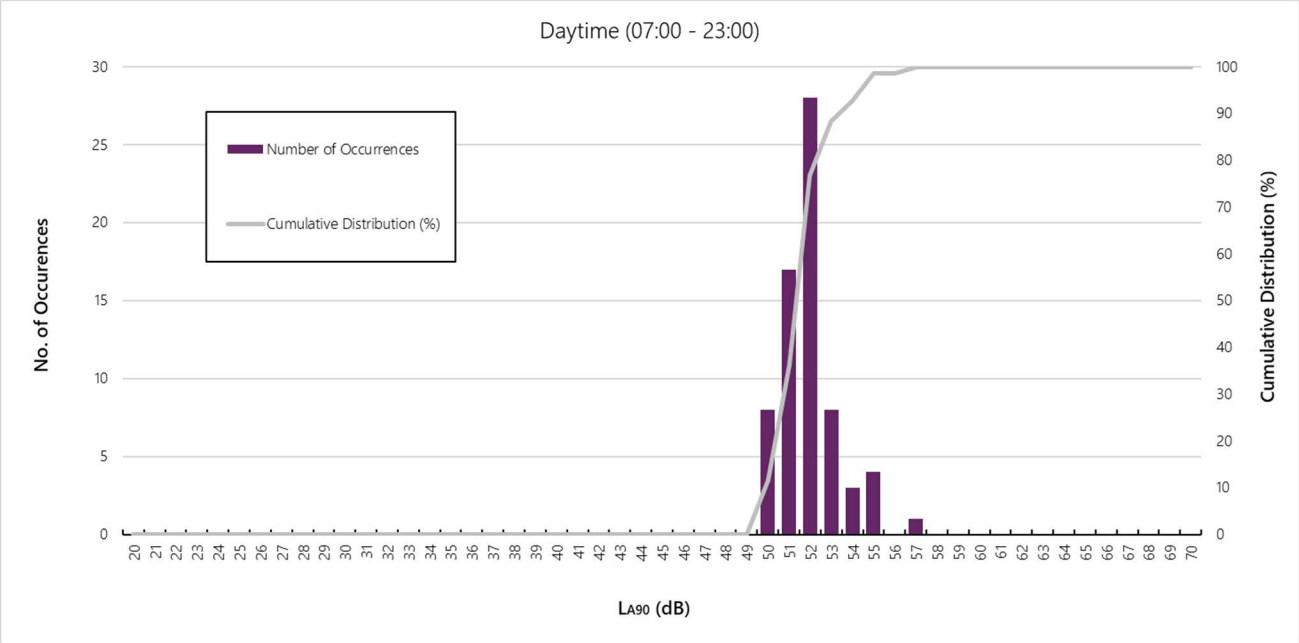


Figure 4.2 – Histogram of measured $L_{A90,15min}$ values



5.0 Noise Assessment

The following summarises the main steps of action in the assessment method:

- a representative background sound level $L_{A90,15mins}$ is determined based upon the results of the environmental noise survey;
- the predicted noise emissions $L_{Aeq,15mins}$ generated by the proposed plant is predicted outside of the windows of neighbouring noise-sensitive windows in the area;
- the predicted noise emissions are compared to the maximum permissible plant noise rating level outside of neighbouring windows based upon the $L_{A90,15mins}$ and the criteria set by the Local Planning Authority (10 dB below background level, or if tonal, including a 5 dB BS 4142:2014 rating level penalty and thus 15 dB below background); and
- if necessary, mitigation measures are recommended to reduce the predicted rating level.

5.1 Criteria

PJA believes that the following requirements are typically set for plant noise by Camden Council:

- the noise emissions from new plant (all operating at maximum capacity) should be at least 10 dB(A) beneath the representative background sound level when calculated (or measured) at 1m outside of noise-sensitive windows;
- if the plant noise contains a tonal quality (as determined in accordance with BS 4142), then it should be at least 15 dB below (rather than 10 dB below).

The noise-sensitive windows in this case are those of residential properties in the surrounding area.

5.2 Background Sound Levels

The predicted plant noise levels should be assessed against a 'representative' background sound level. This is commonly determined through the results of a baseline sound survey, as has been done in this case.

As a worst-case, the *minimum* values of $L_{A90,15min}$ are used to derive the representative background sound level – listed in Table 5.1.

Table 5.1 – Derived representative background sound level $L_{A90,T}$ at nearby residential NSRs

Noise-Sensitive Receptor (NSR)	Period	Representative Background Sound Level $L_{A90,T}$ (dB)
1m outside of a residential window	Daytime (07:00 to 23:00)	50

5.3 Maximum Plant Noise Emissions

A noise limit of 10 dB below the representative background sound level should apply, as the extract fan is unlikely to be tonal in quality. The maximum plant noise emission levels at 1m outside of noise-sensitive windows are therefore given in Table 5.2.

Table 5.2 – Maximum rating level $L_{Ar,Tr}$ for all nearby residential NSRs

Noise-Sensitive Receptor (NSR)	Period	Maximum Specific Noise Level L_{Aeq} at 1m from the outside of the window (dB)
1m outside of a residential window	Daytime (07:00 to 23:00)	40

5.4 System Specification

5.4.1 Fan

The proposed extract fan is an S&P TD-1000/200 SILENT model [1]. The relevant data for in-duct sound power levels on the outlet side of the fan are provided in Table 5.3. Extracts from the manufacturer's datasheet [2] are in Appendix D. Note that the octave band levels below have been converted into Z-weighted/unweighted vales from the A-weighted values given by the manufacturer.

Table 5.3 – In-duct sound power level data for the proposed extract fan

Model	Source Type	Sound Power Levels (SWL), dB							
		Octave Band Centre Frequencies, Hz							dB(A)
		63	125	250	500	1 k	2 k	4 k	
S&P TD-1000/200 SILENT	In-duct inlet outlet	72	63	63	64	66	64	61	70

5.4.2 Silencer

PJA recommends that an in-duct silencer is placed shortly after the extract fan on the atmospheric side. The following proposed attenuation for the silencer has been considered within the assessment (and therefore the silencer installed by the applicant should meet these minimum sound reduction indices).

1 - https://www.justfans.co.uk/silent-1000200-p-1902.html
2 - https://statics.solerpalau.com/media/import/documentation/EN_TD-SILENT.pdf

Table 5.4 – Insertion losses of the proposed in-duct silencer

Model	Insertion Loss (IL), dB						
	Octave Band Centre Frequencies, Hz						
	63	125	250	500	1 k	2 k	4 k
Systemair LDC 200-600 Silencer [3]	2	3	7	16	21	23	9

5.4.3 Ducting

The extraction duct/flue will be a ≈200mm diameter circular flue. PJA has based the assessment on data from several research papers/M&E design guides [4] [5] [6] which suggest transmission losses for single skin circular ducts – the lowest of which are shown in Table 5.5. It is known that the best duct configuration to reduce fan noise breakout is a circular shape – as the hoop strength of a circular duct is very good (particular a spiral round duct rather than a long seam duct); with much lesser stiffness than a rectangular duct. The low-frequency transmission loss in particular is substantial in a circular duct.

Table 5.5 – Estimated transmission losses of the noise break-out from the ducting

Ducting	Transmission Loss (dB)						
	Octave Band Centre Frequencies, Hz						
	63	125	250	500	1 k	2 k	4 k
200mm diameter single skin spiral round circular ducting	45	50	26	26	25	22	36

5.4.4 Anti-Vibration Fixings

Anti-vibration fixings and rubber washings on screws/bolts should be installed where the extract fan is fixed to the building structure or the suspension system. The steel ductwork should also be mounted using these fixings.

Such fixing would usually be made of a resilient material such as rubber; a mount that incorporates a spring; or elastomeric or spring hangers for units suspended from the ceiling. Manufacturers will usually provide these items as standard, and they should be applied to any connection from the extract fan with the building structure to dampen vibration transmitting into it.

3 - https://www.systemair.com/en/products/residential-ventilation-systems/ducts/silencers/inflexible-silencers/ldc?sku=5194#tech-specs-ecom-acoustic-data
4 - http://www.vibrationdata.com/tutorials2/AG31-010lo.pdf
5 - https://digitalscholarship.unlv.edu/cgi/viewcontent.cgi?article=1036&context=rtds
6 - https://www.ahrinet.org/App_Content/ahri/files/STANDARDS/AHRI/AHRI_Standard_885_2008_with_Addendum_1.pdf

5.5 Predicted Noise Emissions

The noise predictions within this report have been undertaken using the proprietary software CadnaA® by DataKustik, a 3-D noise mapping package that implements a wide range of national and international standards, guidelines, and calculation algorithms, including those set out in ISO 9613-2:1996. A full explanation of the noise modelling is provided in Appendix E, along with images and noise maps/results from the model.

The noise map in Figure E.2 shows the predicted specific noise levels (L_{Aeq}) from the units at 2nd floor window height (the height of the worst-affected window on the top floor of the building).

Table 5.6 summarises the assessment result, showing the predicted level outside of the worst-affected neighbouring window. It is seen that the maximum permissible level during the proposed daytime opening hours is met.

Table 5.6 – Predicted noise levels outside of the worst-affected neighbouring window

Period	Predicted Plant Noise Level L_{Aeq} (dB)	Maximum Plant Noise Level L_{Aeq} (dB)	Compliant?
Daytime (07:00 to 23:00) Tr = 15-minutes	35	≤40	**Yes (-5 dB)**

6.0 Vibration Assessment

The typical criteria of Camden Council states: "*Prior to use, plant or equipment and ducting at the development shall be mounted with proprietary anti-vibration isolators and fan motors shall be vibration isolated from the casing and adequately silenced and maintained as such.*"

The risk of structure-borne vibration/sound transfer will be negligible providing that anti-vibration fixings and rubber washings on screws/bolts are installed where the extract fan is fixed to the building structure or the suspension system. The steel ductwork should also be mounted using these fixings.

Such fixing would usually be made of a resilient material such as rubber; a mount that incorporates a spring; or elastomeric or spring hangers for units suspended from the ceiling. Manufacturers will usually provide these items as standard, and they should be applied to any connection from the extract fan with the building structure to dampen vibration transmitting into it.

Appendix A – Acoustic Terminology and Concepts

A.1 – Glossary

Table A.1 – Glossary of acoustic terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio of the root-mean-square pressure of the sound and a reference pressure (2x10-5 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e., 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Frequency	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4000Hz (4kHz). This is roughly equal to the range of frequencies on a piano.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period. This parameter is typically considered as a good representation of the 'average' overall noise level. It is referred to technically as the A-weighted equivalent continuous sound level and is a dB(A) as defined above.
$L_{A90,T}$	The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level'.
$L_{AFmax,T}$	The maximum A-weighted noise level during the measurement period T.

A.2 – Subjective Changes in Noise Level

Table A.2 – Subjective loudness from an increase or decrease in sound pressure level

Change in sound pressure level	Relative change in sound power energy (multiplier)		Change in apparent subjective loudness (for mid-frequency range)
	Decrease	Increase	
3 dB	1/2	2	'Just perceptible'
5 dB	1/3	3	'Clearly noticeable'
10 dB	1/10	10	'Half or twice as loud'
20 dB	1/100	100	'Much quieter, or louder'

Appendix B – Relevant Planning Policies and Guidelines

B.1 – National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. The NPPF provides a framework within which local people and their council can produce their own distinctive local and neighbourhood plans. With explicit reference to noise, the NPPF states that *"Planning policies and decisions should contribute to and enhance the natural and local environment by … preventing new and existing development from contributing to, being put at unacceptable risk from … noise pollution"*.

B.2 - Noise Policy Statement for England (NPSE)

The NPPF refers to the Noise Policy Statement for England (NPSE), which applies to most forms of noise including environmental noise. The NPSE sets out the long-term vision of Government 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."*. It aims that *"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 use of the terms *"significant adverse"* and *"adverse"* are key phrases within the NPSE. The guidance establishes the concept of how the level of adverse effect on health and quality of life can be referenced including:

- NOEL – No Observed Effect Level - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed 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.

Under the first aim of the NPSE ("avoid significant adverse impacts on health and quality of life"), an impact in line with SOAEL should be avoided. Under the second aim ("mitigate and minimise adverse impacts on health and quality of life"), where the impact lies somewhere between LOAEL and SOAEL, requiring that all reasonable steps are taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development, but does not mean that such adverse effects cannot occur.

B.3 - Planning Practice Guidance on Noise (PPG-N)

The Planning Practice Guidance on Noise (PPG-N) is part of a suite of web-based guidance which is intended to support the implementation of the policies in the NPPF and the NPSE.

It aids in expanding on the definitions form the NPSE of NOEL, LOAEL and SOAEL, by linking these terms to 'examples of outcomes', i.e., changes in behaviour and/or attitude to noise. The table below summarises the guidance from PPG-N in this regard.

Table B.1 – Noise exposure hierarchy based on the likely average response – adapted from PPG-N

Perception	Examples of outcomes	Increasing effect level	Action
NOEL - No Observed Effect Level [1]			
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
LOAEL - 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 the 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
SOAEL - 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 a change in the 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 the 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

[1] This line is an assumption of the adverse effect level and is not explicitly referenced by PPG-N, though this appears to be a safe assumption.

B.4 - BS 4142:2014

BS 4142:2014 *'Methods for rating and assessing industrial and commercial sound'* is intended to be used to assess the potential adverse impact of sound of an industrial and/or commercial nature, at nearby noise-sensitive receptor (NSR) locations within the context of the existing sound environment.

B.4.1 - Definitions

BS 4142:2014 provides the following definitions which are relevant at this pre-construction stage of assessment:

- **Background Sound Level, $L_{A90,T}$:** A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
- **Rating Level, $L_{Ar,Tr}$:** Specific sound level plus any adjustment for the characteristic features of the sound.
- **Reference Time Interval, T_r:** Specified interval over which the specific sound level is determined. This is 60-minutes during the day (07:00 – 23:00) and 15-minutes at night (23:00 – 07:00).
- **Specific Sound Level, $L_s = L_{Aeq,Tr}$:** Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.
- **Specific Sound Source:** Sound source being assessed.

The BS 4142:2014 definition of sound of an industrial and/or commercial nature includes "*sound from fixed installations which comprise mechanical and electrical plant and equipment*". The scope of BS 4142:2014 is not intended for sound from the passage of vehicles on public roads; people; and 'other sources falling within the scopes of other standards or guidance'.

B.4.2 - Specific Sound Level

The specific sound level L_s is the equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r, of 60-minutes during the day (07:00 – 23:00) and 15-minutes at night (23:00 – 07:00).

B.4.3 - Rating Level

The rating level $L_{Ar,Tr}$ is the specific sound level L_s plus any 'penalties' which account for the characteristic features of the sound.

BS 4142:2014 provides the following with respect to the application of penalties to account for *"the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention"*.

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

- *Impulsivity – A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible;*
- *Intermittency – When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied; and*
- *Other Sound Characteristics – Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."*

PJA consider the word 'perceptible' to be important, and variable depending on the context of a site. For example at a site with a relatively high background sound level of 50 dB(A), an 'impulsive' sound source with a specific sound level of 30 dB(A) at an NSR is unlikely to be perceptible and should probably not be penalised.

However, the same source at a site with a lower background level of 30 dB(A) would be perceptible, and therefore a penalty of 3 or 6 dB could be applied to the rating level, with possibly a 9 dB penalty being applied if the specific sound level were to rise from 30 to 40 dB(A). Therefore the context is important in applying rating level penalties.

B.4.4 - Background Sound Level

BS 4142:2014 states that *"in using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."*

BS 4142:2014 further states that *"a representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either minimum or modal value"*. Hence BS 4142:2014 does not provide a 'black and white' method of obtaining the assessment level for background sound $L_{A90,T}$. Note that it is standard practice that the $L_{A90,T}$ is determinable from the results of a baseline sound survey conducted at positions representative of sound levels at the nearest or worst affected NSRs.

B.4.5 - Assessment of Adverse Impact

The assessment of adverse impact contained in BS 4142:2014 is undertaken by comparing the rating level $L_{Ar,Tr}$, to the measured representative background sound level $L_{A90,T}$ outside the sensitive receptor location.

The significance of the impact of an industrial or commercial sound source depends on both the margin by which the rating level $L_{Ar,Tr}$ exceeds the background sound level $L_{A90,T}$ and the context in which the sound occurs. It is therefore essential to place the sound in context. But in general, *"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."*

Appendix C – Noise Survey Methodology

C.1 – Survey Equipment

The monitoring equipment used for the baseline noise survey is detailed in the table below. The sound level meter was calibrated before and after the survey, with no significant drifts of greater than 0.5 dB observed. The sound level meter has been calibrated to a traceable standard within the 24 months preceding the survey, and the calibrators have been calibrated to a traceable standard within the 12 months preceding the survey. The equipment complies with the standards of as BS EN 60942:2003 Class 1 device.

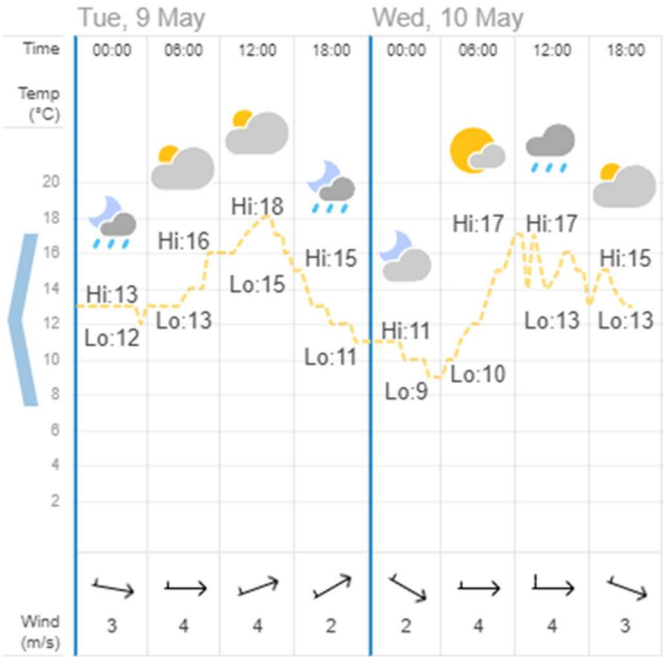
Table C.1 – Equipment used for the noise survey

Name	Serial Number	Last Calibrated	Calibration Due
Casella CEL 633B Class 1 Sound Level Meter	0221364	Oct-22	Oct-24
Casella CEL 252 Class 1 Microphone	21198	Oct-22	Oct-24
Cirrus CRL511E Class 1 Acoustic Calibrator	035235	Nov-22	Nov-23

C.2 – Meteorological Conditions

During the survey, weather conditions were generally dry and mild with some wet periods, and wind speeds less than 4 ms^{-1} (the microphone was fitted with a weather protection kit/windshield). These weather conditions are suitable for the measurement of environmental noise in accordance with BS 7445 '*Description and Measurement of Environmental Noise*'. The weather data below has been sourced from https://www.timeanddate.com/weather/uk/london/historic?month=5&year=2023.

Figure C.1 – Meteorological conditions during the survey



C.3 – Photos

Figure C.2 – Photograph of the monitoring position

Appendix D - Manufacturer Noise Data

TECHNICAL CHARACTERISTICS

TD-SILENT	Speed (r.p.m.)	Maximum absorbed power (W)	Maximum absorbed current (A)	Maximum airflow (m³/h)	Sound pressure level* (dB(A))	Min-Max air temperature (°C)	Weight (kg)	Duct diameter (mm)	3-speed switch	Speed con-troller	Wiring diagram** (n)
TD-160/100 N SILENT	2400	29	0,17	180	24	-20/+40	1,4	100	COM-2 REGUL-2	RMB-1,5 REB-1	9, 10
	2200	18	0,11	150	22						
TD-250/100 SILENT	2210	27	0,12	250	25	-20/+40	5,4	100	COM-2 REGUL-2	RMB-1,5 REB-1	9, 10
	1680	21	0,1	200	20						
TD-350/125 SILENT	2100	27	0,12	330	23	-20/+40	5	125	COM-2 REGUL-2	RMB-1,5 REB-1	9, 10
	1650	21	0,1	260	18						
TD-500/150-160 SILENT 3V	2480	59	0,26	550	27	-20/+60	6	150/160	COM-3 INTER 4P	RMB-1,5 REB-1	9, 10
	2060	50	0,22	450	22						
	1610	45	0,2	350	17						
TD-800/200 SILENT 3V	2170	102	0,5	910	28	-20/+60	8,7	200	COM-3 INTER 4P	RMB-1,5 REB-1	9, 10
	1870	92	0,47	780	24						
	1660	90	0,46	690	22						
TD-1000/200 SILENT 3V	2450	130	0,55	1.040	29	-20/+60	8,7	200	COM-3 INTER 4P	RMB-1,5 REB-1	9, 10
	2210	127	0,55	910	27						
	1920	122	0,53	790	24						
TD-1300/250 SILENT 3V	2530	204	0,85	1.320	36	-20/+60	20	250	COM-3 INTER 4P	RMB-1,5 REB-1	12, 13
	2230	163	0,68	1.160	33						
	2030	144	0,6	1.040	31						
TD-2000/315 SILENT 3V	2670	293	1,25	1.770	39	-40/+60	25	315	COM-3 INTER 4P	RMB-1,5 REB-2,5	12, 13
	2490	232	0,97	1.610	38						
	2240	190	0,78	1.480	36						

* Sound pressure level radiated at 3 m at free air conditions with rigid ducts at the inlet and at the outlet.
** See section of Wiring Diagrams.

Sound power level spectrums in dB(A)

Working point		63	125	250	500	1.000	2.000	4.000	8.000	LwA
1	Inlet	27	40	50	60	62	64	60	53	68
	Outlet	46	47	54	61	66	65	62	55	70
	Break-out	17	33	35	44	45	43	35	28	49
2	Inlet	27	38	49	59	61	62	56	49	66
	Outlet	41	43	52	59	63	61	57	50	67
	Break-out	16	31	34	42	43	40	31	24	47
3	Inlet	28	41	54	63	63	62	58	51	68
	Outlet	32	41	55	62	62	59	56	47	67
	Break-out	17	33	39	46	45	41	33	26	50
4	Inlet	26	39	49	59	61	63	58	51	67
	Outlet	44	46	53	59	64	64	61	53	69
	Break-out	15	32	34	43	43	41	33	26	48
5	Inlet	25	37	47	57	59	61	55	48	65
	Outlet	39	42	50	58	62	60	56	49	66
	Break-out	15	29	33	41	42	39	30	23	46
6	Inlet	26	39	52	61	61	61	56	50	67
	Outlet	31	39	54	60	61	58	54	46	65
	Break-out	16	32	37	45	43	39	31	24	48
7	Inlet	23	36	46	56	58	60	55	48	64
	Outlet	41	43	50	56	61	61	58	50	66
	Break-out	12	29	31	40	40	38	30	23	45
8	Inlet	23	34	45	54	57	58	52	45	62
	Outlet	37	39	47	55	59	57	53	46	63
	Break-out	12	26	30	38	39	36	27	20	43
9	Inlet	24	37	50	59	59	58	54	47	64
	Outlet	28	37	52	58	58	55	52	43	63
	Break-out	13	30	35	43	41	37	29	22	46

Appendix E – Calculations

The noise predictions within this report have been undertaken using the proprietary software CadnaA® by DataKustik, a 3-D noise mapping package that implements a wide range of national and international standards, guidelines, and calculation algorithms, including those set out in ISO 9613-2:1996.

All of the objects within the model (buildings, roads, barriers, foliage, etc) have been imported from OpenStreetMap. The heights of the buildings and roads have been based upon Google Earth Pro, using the 3D view to be able to measure the elevation heights at the tops of objects, and then inserting this manually into the model. Where OpenStreetMap contains little or inaccurate information, the objects have been drawn manually. The scaled site plan, floor plan, and elevation for the proposed development have been accounted for in the model.

The noise model has been used to predict the resulting L_{Aeq} noise emissions from the proposed plant.

The noise model has assumed:

- downwind propagation, i.e., a wind direction that assists the propagation of sound from source to receptor, as a worst-case;
- a maximum reflection factor of three where buildings and barriers are assumed to have a 'smooth' reflective façade, as a worst-case;
- a ground absorption factor of 0 to represent hard, reflective ground as a worst-case.
- receptor heights on the façade at 1st floor (5.5m), 2nd floor (8.5m), and 3rd floor (11.5m) window heights, placed at 1m outside of elevations which contain windows.
- atmospheric sound absorption based upon a temperate of 10°C and a humidity level of 70%, as per Table 2 of ISO 9613-2:1996/

The images on the following pages contain the results of the mapping

Figure E.1 – 3D view of the model setup

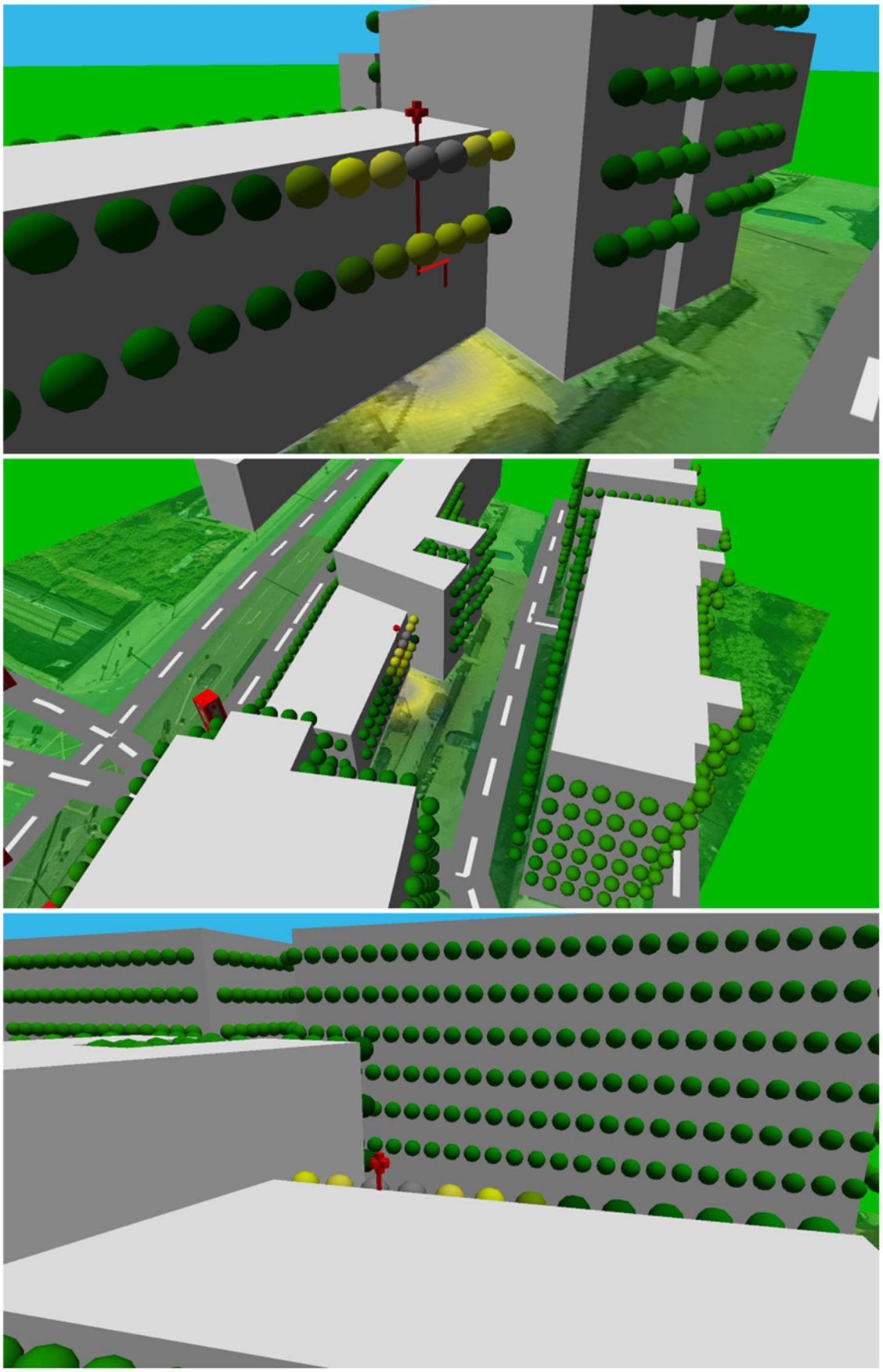


Figure E.2 – Predicted specific noise levels (dB L_{Aeq}) – 2nd floor window height (8.5m)

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