

7 Darnley Road, Gravesend, Kent, DA11 0RU

16th March 2022

ISSUE 01





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This report has been compiled by Deane Austin Ltd (DAA) with all reasonable skill, care and diligence in accordance with generally accepted acoustic consultancy principles. Information contained in this document contains confidential and commercially sensitive information and shall not be disclosed to third parties.				

1.0 INTRODUCTION

DAA Group has been appointed to carry out a Noise Impact Assessment at 7 Darnley Road, Gravesend, Kent, DA11 0RU to support a Planning Application Ref: 20150923 for the change of use of the basement and ground floor from offices to a restaurant (Use Class A3) incorporating the erection of a single storey rear extension with terrace over, enlargement of the basement and conversion of the first floor and loft space into 1no. self-contained maisonette with access via 4-6 Darnley Road. The purpose of the report is to satisfy the following conditions:

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“7 Before the development hereby permitted commences a scheme showing how noise/vibration created by the ductwork serving the air purification system shall be adequately controlled within the maisonette shall be submitted and approved in writing.

8. Before the development hereby permitted commences details of the ventilation extraction system for the restaurant, particularly regarding odour elimination abilities, residence time of the air within the filters and likely noise emissions shall be submitted to and approved in writing by the Local Planning Authority. The development shall be carried out in accordance with the approved details.

by the Local Planning Authority prior to commencement of any works on site. All approved works shall be carried out prior to first residential occupation of the maisonette.”

to ensure it does not prejudice the amenities of any future occupants in accordance with:

- National Planning Policy Framework 2021 (NPPF)
- National Planning Practice Guidance (NPPG)
- Gravesend Local Plan
- The Environmental Health legislation 'the Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018).'

This report presents the results of background noise levels and outlines any necessary mitigation measures.

The technical content of this assessment has been provided by a Tech member of the Institute of Acoustics.

The Institute of Acoustics is the UK's professional body for those working in acoustics, noise and vibration

2.0 NOISE CRITERIA

2.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

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The Department for Communities and Local Government introduced the National Planning Policy Framework (NPPF) in March 2012. The latest revision of the NPPF is dated July 2021.

The NPPF sets out the Government's planning policies for England and how these are expected to be applied. It provides a framework where local Councils can produce their own local and neighbourhood plans which reflect the needs of their communities.

In conserving and enhancing the natural environment, the planning system should prevent both new and existing development from contributing to, or being put at, unacceptable risk from environmental factors including noise.

Planning policies and decisions should aim to avoid noise giving rise to significant adverse impacts on health and quality of life as a result of new development. Conditions may be used to mitigate and reduce noise to a minimum so that adverse impacts on health and quality of life are minimised. It must be recognised that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them. Reference is made within NPPF to the Noise Policy Statement for England (NPSE) as published by DEFRA in March 2015

2.2 NOISE POLICY STATEMENT FOR ENGLAND (NPSE)

The long-term vision of the NPSE is stated within the documents scope, 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'. The policy aims are stated to:

- 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 application of NPSE should mean that noise is properly taken into account at the appropriate time (for example in planning applications or appeals) where it must be considered alongside other relevant issues. The guiding principles of Government policy on sustainable development should be used to assist in the implementation of the NPSE.

The NPSE should apply to all types of noise apart from occupational noise in the workplace. The types of noises defined in the NPSE includes:

- Environmental noise from transportation sources;
- Neighbourhood noise which includes noise arising from within the community; industrial premises, trade and business premises, construction sites and noise in the street

The Noise Policy Statement England (NPSE) outlines observed effect levels relating to the above, as follows:

- **NOEL – No Observed Effect Level**

o 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**

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

- **SOAEL – Significant Observed Adverse Effect Level**

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

As stated in The Noise Policy Statement England (NPSE), it is not currently possible to have a single objective based measure that defines SOAEL that is applicable to all sources of noise in all situations. Specific noise levels are not stated within the guidance for this reason, and allow flexibility in the policy until further guidance is available.

2.3 ProPG: PLANNING AND NOISE

As outlined above, the National Planning Policy Framework encourages improved standards of design, although it provides no specific noise levels which should be achieved on site for varying standards of acoustic acceptability, or a prescriptive method for the assessment of noise.

ProPG: Planning and Noise was published in May 2017 in order to encourage better acoustic design for new residential schemes in order to protect future residents from the harmful effects of noise. This guidance can be seen as the missing link between the current NPPF and its predecessor, PPG24 (Planning Policy Guidance 24: Planning and Noise), which provided a prescriptive method for assessing sites for residential development, but without the nuance of 'good acoustic design' as outlined in ProPG.

ProPG allows the assessor to take a holistic approach to consider the site's suitability, taking into consideration numerous design factors which previously may not have been considered alongside the noise level measured on site, for example the orientation of the building in relation to the main source of noise incident upon it.

It should be noted this document is not an official government code of practice, and neither replaces nor provides an authoritative interpretation of the law or government policy, and therefore should be seen as a good practice document only.

2.4 BRITISH STANDARD 4142: 2014

British Standard (BS) 4142:2014 "Methods for rating and assessing industrial and commercial sound" describes methods for assessing the likely effects of sound on premises used for residential purposes.

It includes the assessment of sound from industrial and manufacturing processes, M&E plant and equipment, loading and unloading of goods and materials, and mobile plant/vehicles on the site. It can be used to assess sound from proposed, new, modified or additional industrial/commercial sources, at existing or new premises used for residential purposes.

The method described in BS4142: 2014 use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

The standard describes methods to measure and determine ambient, background and residual sound levels, and the rating levels of industrial/commercial sound. BS 4142: 2014 requires consideration of the level of uncertainty in the data and associated calculations.

BS 4142 is not intended to be used for the derivation or assessment of internal sound

levels, or for the assessment of non-industrial / commercial sources such as recreational activities, motorsport, music and entertainment, shooting grounds, construction and demolition, domestic animals, people, and public address systems for speech.

The Reference Time Interval, T, is defined in the standard as the "specified interval over which the specific sound level is determined", which is 1 hour during the daytime (07:00 to 23:00 hours) and 15 minutes during the night (23:00 to 07:00 hours).

Ambient sound is defined in BS 4142: 2014 as "totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far". It comprises the residual sound and the specific sound when present.

Residual sound is defined in BS 4142: 2014 as "ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound".

The background sound level is the LA90, T of the residual sound level, and is the underlying level of sound. Measurements of background sound level should be undertaken at the assessment location where possible or at a comparable location.

The measurement time interval should be sufficient to obtain a representative value (normally not less than 15 minutes) and the monitoring duration should reflect the range of background sound levels across the assessment period. The background sound level used for the assessment should be representative of the period being assessed.

The specific sound level is the LAeq,T of the sound source being assessed over the reference time interval, Tr. BS 4142: 2014 advises that Tr should be 1 hour during the day and 15 minutes at night.

The rating level is the specific sound level plus any adjustment for the characteristics of the sound (tone, impulse, intermittent or other acoustic feature). The standard describes subjective and objective methods to establish the appropriate adjustment. The adjustments for the different features and assessment methods are summarised in the table below.

Acoustic Feature Corrections in BS4142: 2014

Acoustic Feature	Adjustment for Acoustic Feature		
	Subjective Methods	Objective Methods	
Tonality	+2 dB if just perceptible +4 dB if clearly perceptible +6 dB if highly perceptible	Third Octave Analysis	Narrow Band Analysis
		+6 dB if tones identified	Sliding scale of 0 to +6 dB depending on audibility of tone
Impulsivity	+3 dB if just perceptible +6 dB if clearly perceptible +9 dB if highly perceptible	Sliding scale of 0 to +9 dB depending on prominence of impulsive sound	
Intermittency	+ 3 dB if intermittency is readily distinctive	n/a	
Other	+ 3 dB if neither tonal nor impulsive, but otherwise readily distinctive	n/a	

Where tonal and impulsive characters are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant, it might be appropriate to apply a single correction. The rating level is equal to the specific sound level if there are no features present.



The level of impact is assessed by comparing the rating level of the specific sound source with the background sound level. Typically the greater the difference the greater the magnitude of the impact, depending on the context.

Other factors that may require consideration include the absolute level of sound, the character and level of the residual sound compared to the specific sound, and the sensitivity of the receptor and scope for mitigation.

When the rating level is above the background sound level, a difference of around +5 dB is likely to indicate an adverse impact and a difference of around +10 dB or more is likely to indicate a significant adverse impact, depending on the context.

The lower the rating level with respect to the background sound level, the less likely it is that the specific sound source will have an 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.

3.0 SITE SURVEYS

3.1 SITE DESCRIPTION

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The application site is located on the northern side of Goldhawk Road close to the junction with Lime Grove and forms the end two buildings of a terrace of four / five storey (including basements and rooms within the roofspace) buildings which contain retail uses at ground floor and residential uses on upper floors. The dominant noise source is road traffic noise from the surrounding roads (See Figure 3.1)

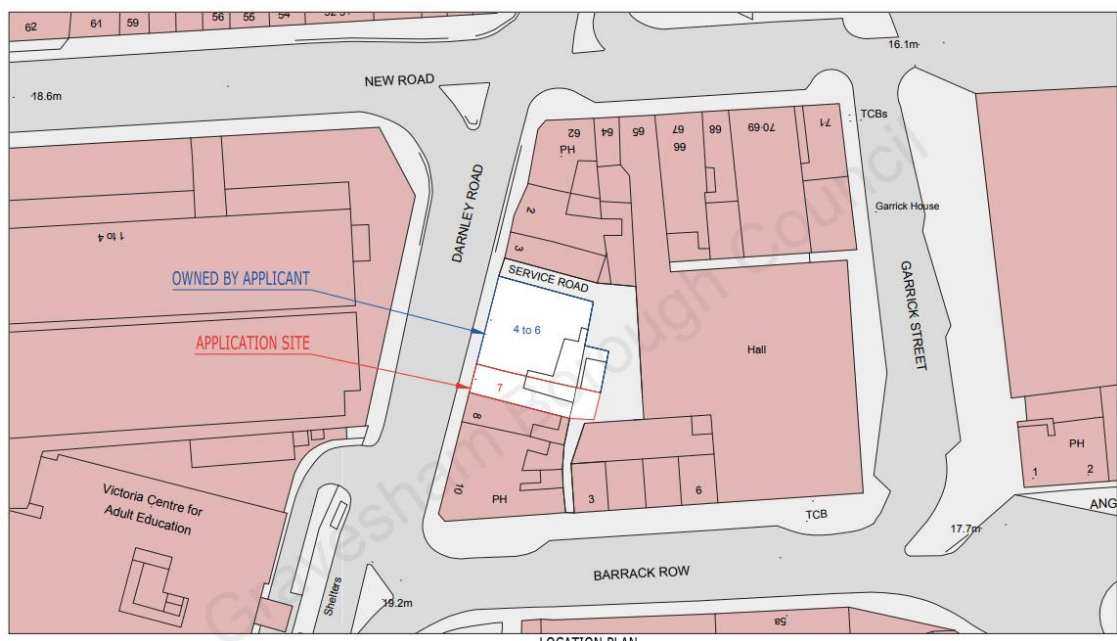


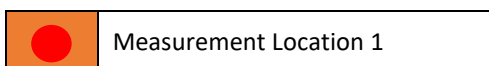
Figure 3.1 – Proposed Site

3.2 ENVIRONMENTAL SITE SURVEY PROCEDURE

24hr noise measurements were taken 1m outside a first-floor window at the rear of the site and logged between the 10th and 11th of February 2022.
(See Figure 3.2).

The measurements were taken to establish the ambient sound level at the site, with respect to criteria of BS8233:2014.

The weather was suitable conditions to carry out the noise survey.



3.3 EQUIPMENT

Instrument manufacturer	Cirrus Research Plc
Model	CR:171A Precision Computing Sound Level Meter
Serial Number	G303498
Microphone Type	MK:224
Serial Number	215146A
Calibrator	CR:515
Serial Number	96653
Cirrus CK: 508 Outdoor Kit	

The calibration of the sound level meters was verified in-situ before any measurements were taken, using the handheld calibrator and reference tone of 114dB at 1kHz. Validation checks at the end of the survey indicated that all instruments had operated within permitted tolerances for drift and measured level.

Copies of Calibration certificates are available upon request.



4.0 NOISE LEVELS

Period	Lowest Recored LA90, 15
07:00 – 23.00	41dB
23:00 – 07:00	36dB

Table 4.0 – recorded Noise Levels

5.0 CONDITION 7

“Before the development hereby permitted commences a scheme showing how noise/vibration created by the ductwork serving the air purification system shall be adequately controlled within the maisonette shall be submitted and approved in writing.”

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5.1 VENTILATION LAYOUT

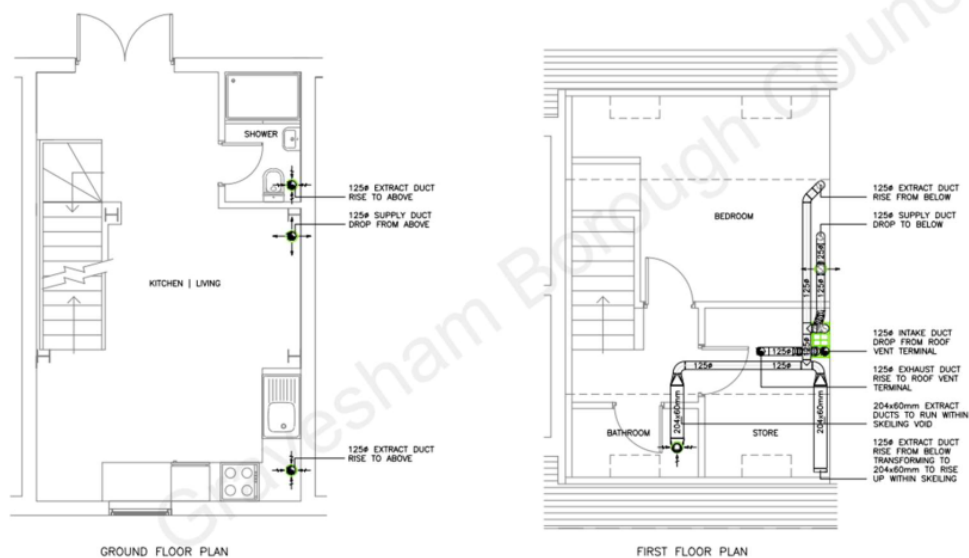


Figure 4.1 – Ventilation Layout

5.2 MVHR REVIEW

It is understood the Client is going to use a Titon HRV 1.25Q unit. See Appendix A).



Manufacturer details below:

MVHR Unit WHHR-Midi unit	Octave Band Centre Frequency (Hz)								
	Sound Power Level, Lw (dB) 34l/s (66%)								
	63	125	250	500	1K	2K	4K	8K	Sound Pressure dBA@3m
Extract	48	58	60	59	60	53	46	43	42dB
Supply	43	52	45	43	45	36	29	26	
Breakout	50	50	47	44	41	34	26	27	

Table 3.0 – Advised plant noise data used for the assessment of Titon HRV 1.25Q.

5.3 INTERNAL NOISE LEVELS FROM MVHR UNITS

A preliminary review of duct-borne noise from the MVHR units has been undertaken to achieve LAeq 30dB (NR20) in bedrooms and LAeq 35dB (NR25) in living rooms.

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All plant and ductwork should be fitted with anti-vibration mounts in accordance with the manufacturer guidelines. This is expected to control structure borne noise to the building to acceptable levels.

To achieve the required noise levels, the ductwork must be fitted with attenuators providing the minimum insertion losses shown in table 3.1.

Attenuator Location All Flats	Octave Band Centre Frequency (Hz) minimum Required Insertion Loss (dB)							
	63	125	250	500	1K	2K	4K	8K
Supply Duct (900L)	9	11	20	38	41	38	35	31
Extract Duct (600L)	4	8	14	30	36	36	31	27

Nendle Acoustics Model: S 100 – 125 ID / 225 OD. 125 Dia Spigot Connections.

Table 3.1 – Attenuator Insertion losses (Room side)

With the above measures in place, noise levels in the dwellings due to the MVHR Units along with external noise sources would meet the requirements of Gravesend Council.

Refer to Tables 1 & 2 in Appendix C for noise emission calculations.

5.4 EXTERNAL NOISE LEVELS FROM MVHR UNITS

On the basis of the measured noise levels and planning requirements of the Local Authority of plant being 10dB below the background noise level, and considering that it is not expected that tonal noise will be generated by the proposed plant unit, the following plant specific sound levels should not be exceeded at the nearest affected noise sensitive receivers:

Monitoring Period	Background Noise Level (Lowest LA90 (15))	Plant Noise Limits LAeq,(15)
07:00 – 23:00	40 dB	30 dB
23:00 – 07:00	36 dB	26 dB

Table 3.2 – External plant noise limits

5.5 RECOMMENDED MITIGATION MEASURES

Both the supply and exhaust ducts to atmosphere must be fitted with attenuators providing the following minimum insertion losses:

Duct Attenuator	Octave Band Centre Frequency (Hz)							
	minimum Required Insertion Loss (dB)							
	63	125	250	500	1K	2K	4K	8K
Intake & Discharge Ducts:	4	8	14	30	36	36	31	27

Table 3.3 – Attenuator Insertion loss. Supplier: Nendle Acoustics: Model S125 – 600 L.

5.6 PREDICTED NOISE LEVELS

The cumulative noise level at the most affected noise sensitive receiver adjacent to the development as well as the most affected apartment within the proposed new development has been calculated on the basis of the above information and assuming the recommended mitigation measures, with reference to the guidelines set out in ISO 9613-2:1996 Attenuation of sound during propagation outdoors - Part 2: General method of calculation.

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Predicted Cumulative Noise Level		Design Criterion
To adjacent Residential Unit	LAeq 25dB	LAeq 26 dB
To new Development	LAeq26dB	

Table 3.4 – Predicted cumulative noise level at most noise affective receivers.

6.0 CONDITION 8

“8. Before the development hereby permitted commences details of the ventilation extraction system for the restaurant, particularly regarding odour elimination abilities, residence time of the air within the filters and likely noise emissions shall be submitted to and approved in writing by the Local Planning Authority. The development shall be carried out in accordance with the approved details. All approved works shall be carried out prior to first residential occupation of the maisonette.”

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6.1 BS4142:2014 ASSESSMENT

On attendance of the site, the kitchen extraction system has already been installed.



Noise measurements indicate an increase in background noise levels whilst the plant was in operation.

LA90 15 Fan Off ¹	LA90, 15 Fan On ¹
41 dB	55dB

Table 6.1 – Noise Levels

6.2 PROPOSED PLANT

It is understood that the proposed outdoor plant is comprised of the following units:

- Flakt Woods – Estoc 67-500-1 Extract Fan

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The flue outlet location is shown below in figure 8.3

Proposed Plant	LWA (dB(A))
Estoc 67-500-1	82

Table 8.2 – Manufacturer supplied Sound power level

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m**
Inlet*	-	74	79	74	71	68	65	58	82	57
Outlet*	-	77	79	76	78	71	67	60	84	61
Breakout*	-	74	70	59	55	45	39	33	75	44

* Lw dB re 10^{-12} W

** dBA re 2×10^{-5} Pa

Sound data at requested duty.

Manufacturer's noise level data gives the following sound power levels of the fan unit. Corrections from sound attenuation due to bends, duct losses and end reflection, etc, have been taken where considered appropriate.

6.3 CLOSEST NOISE SENSITIVE RECEIVER

The closest noise sensitive receiver to the installation location of the plant has been identified as being a future potential residential window located approximately 3 meters from the proposed location of the extraction outlet and 4 meters from the extract fans as shown in Figure 8.3

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	Proposed Location Kitchen Extraction Outlet
	Nearest Residential Noise Sensitive Window to Outlet
	Measurement Location
	Proposed Location Fan
	Nearest Residential Noise Sensitive Window to Fan

6.3 NOISE EMISSION CRITERION

It is understood that the permitted operating hours are between 09.00 and 22:00.

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It is determined that the proposed plant is not considered to contain tones. In addition, the proposed operation of the equipment is also unlikely to be sufficiently intermittent to attract attention at the nearest noise sensitive property. On this basis, sound levels must be 10 dB below the minimum external background sound at the nearest noise sensitive property.

The criteria for plant sound, to be achieved at a point 1m from the closest noise sensitive window, has been set as highlighted in Table 8.4 in order to comply with the Local Authority requirements

	Plant Sound Level Limit
Time Period	Kitchen Extract Fan
Daytime (09:00 – 22:00)	30dB

Table 8.4 - Proposed noise emissions criterion 1m at the nearest noise sensitive window.

7.0 BS4142:2014 NOISE ASSESSMENT – 1m at Nearest residential Window

On attending site, the kitchen ventilation system has already been installed. It was audible whilst in operation. The excess noise seems to be mostly breakout noise from the fan (located on the flat roof) but its hard to assess if there is also excess noise from the flue outlet. Therefore, the rating level of the installed plant has been calculated with the fan details and the two silencers that have already been installed - 2 x Flakt Woods B2DM x 500 at the fan outlet and the breakout noise from the fan.

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BS4142:2014 Noise Assessment – installed plant	
Source	Kitchen Extract Fan Outlet
Operating Period	09.00 – 22:00
Reference Time Interval (Tr)	15 minutes
Element	Level (dB)
Specific Sound Level	43
Representative Background Noise Level (LA90)	40
Rating Level	43
Excess of Rating over Background Sound Level	+3

BS4142:2014 Noise Assessment – installed plant	
Source Operating Period	Kitchen Extract Fan Breakout 09.00 – 22:00
Reference Time Interval (Tr)	15 minutes
Element	Level (dB)
Specific Sound Level	50
Representative Background Noise Level (LA90)	40
Rating Level	50
Excess of Rating over Background Sound Level	+10

Detailed calculations are shown in Appendix D.

8.0 MITIGATION MEASURES

8.0.1 – NOISE EMISSIONS KITCHEN EXTRACTION SYSTEM

The calculations correlate with the noise measurements taken, that the rating levels of the kitchen extraction system is in excess of the background noise. It is mostly coming from the breakout noise of the unit.

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To reduce duct breakout noise on the fan inlet an additional attenuator is required to be fitted on the discharge side of the fan, similar to an Acoustica CP03-C*-0500- 2D with the below insertion losses:

<i>INSERTION LOSS (dB) – CENTRE BAND FREQUENCY</i>								
Hz	63	125	250	500	1K	2K	4K	8K
CP03-C*-0500- 2D	3	7	8	19	20	17	14	11

The attenuator's acoustic media shall have to be lined with 'Melinex' to enable the kitchen extract system to be regularly steam cleaned.

To mitigate the excess breakout noise, the plant will need to be enclosed in an acoustic enclosure with an insertion of 20dB.

8.0.2 – VIBRATION

In addition to the control of airborne noise transfer, it is important to consider the transfer of noise as vibration to adjacent properties as well as any sensitive areas of the same building. The duct should be isolated from the structure of the building using anti-vibration. The isolators shall incorporate rubber or neoprene high-frequency isolation pads. The fan should be installed with flexible connections to adjacent structures. Antivibration mounts are widely available from suppliers/installers often in pedestal rubber mountings.

Examples of these are MPO and MP1, and ISL Maxi pedestal vibration mounts. These types of anti-vibration and shock isolators are industry standard and commonplace for mechanical plant installations. They are designed to provide medium to high frequency isolation from vibration and noise via high resilience rubber.



9.0 SUMMARY AND CONCLUSIONS

A baseline noise survey has been undertaken by DAA Group to establish the prevailing noise climate in the locality of 7 Darnley Road, Gravesend, Kent, DA11 0RU in support of a planning application for a residential development and the relocation of Extraction Flue.

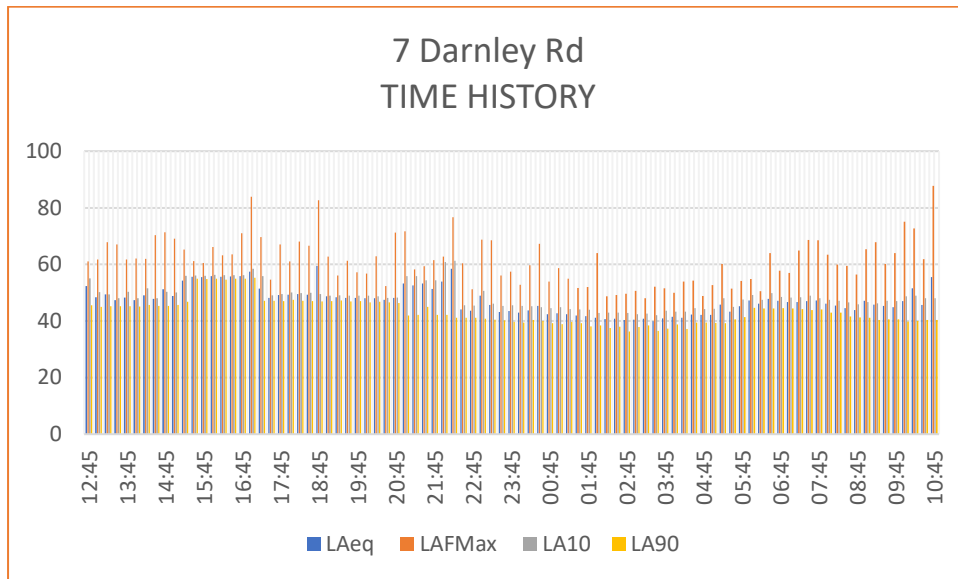
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The measured levels have been assessed against currently available standards and guidance documents including, National Planning Policy Framework 2021 (NPPF), National Planning Practice Guidance (NPPG) and Local Authority requirements.

Appropriate mitigation measures have been outlined for the MVHR Ventilation System and for the commercial kitchen ventilation system in order to comply with the required criteria.

It is concluded that, on noise grounds, the proposed development will not prejudice the amenities of any future occupants provided the above points are taken into consideration.

APPENDIX A – MEASUREMENTS



APPENDIX B - ACOUSTIC TERMINOLOGY

B.1 WEIGHTED DECIBEL, dB(A)

The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. An increase or decrease of approximately 10 dB corresponds to a subjective doubling or halving of the loudness of a noise, and a change of 2 to 3 dB is subjectively barely perceptible.

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B.2 EQUIVALENT CONTINUOUS SOUND LEVEL, LAeq

Another index for assessment for overall noise exposure is the equivalent continuous sound level, LAeq. This is a notional steady level which would, over a given period, deliver the same sound energy as the actual time-varying sound over the same period.

B.3 MAXIMUM NOISE LEVEL, L_{max}

The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125 ms in duration.

B.4 NOISE RATING, NR

Noise ratings are used as a single figure criterion for specifying services noise in buildings. Each noise rating value has an associated spectrum of defined values in each third or octave frequency band. To determine the noise rating of a room the measured spectrum is compared to a set of noise rating curves. The highest NR curve that crosses any single frequency band of the measurement determines the noise rating for the room.

The single figure noise rating is read at the 1 kHz band.

B.5 SOUND LEVEL DIFFERENCE (D)

The sound insulation required between two spaces may be determined by the sound level difference needed between them. A single figure descriptor which characterises a range of frequencies, the weighted sound level difference, D, is sometimes used (BS EN ISO 717-1). This parameter is not adjusted to reference conditions.

The standardized level difference, D_{n,T} is a measure of the difference in sound level between two rooms, in each frequency band, where the reverberation time in the receiving room has been normalised to 0.5 s. This parameter measures all transmission paths, including flanking paths.

The weighted standardized level difference, D_{nTw}, is a measure of the difference in sound level between two rooms, which characterises a range of frequencies and is normalised to a reference reverberation time

B.6 SOUND REDUCTION INDEX (R)

The sound reduction index (or transmission loss) of a building element is a measure of the loss of sound through the material, i.e. its attenuation properties. It is a property of the component, unlike the sound level difference which is affected by the common area between the rooms and the acoustic of the receiving room. The weighted sound reduction index, R_w, is a single figure description of sound reduction index characterising a range of frequencies, which is defined in BS EN ISO 717-1: 1997. The R_w is calculated from measurements in an acoustic laboratory

B.7 STATISTICAL NOISE LEVELS (L_{A90} , (T) L_{A1} , (T) L_{A10} , (T) etc.)

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L_{A10} is the level exceeded for ten per cent of the time under consideration, has historically been

adopted in the UK for the assessment of road traffic noise. The L_{A90} is the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The L_{A1} the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted L_{A10} , dB L_{A90} , dB. etc. The reference time (T) is normally included, e.g. L_{A10} , (5min), & L_{A90} , (8hr).

B.8 TYPICAL NOISE LEVELS

Typical noise levels are given in the following table.

Noise Level dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-offs at 100 m
110	Chain saw at 1 m
100	Inside disco
90	Heavy lorries at 5 m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heaters at 1m
40	Living room
30	Ventilation Noise in Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing.

APPENDIX C – BS4142 CALCULATIONS



7 Darnley Rd. External Noise Transmission.															
Kitchen Extract System.															
NOISE EMISSION CALCULATION															
ITEM	PARAMETER				HZ	63	125	250	500	1K	2K	4K	8K	dBA	
1	Schedule of Plant		Qty												
2	Flakt Woods														
3	Model: ESTOC x 500		1	Swl	dB	+	77	77	79	76	78	71	67	60	84
4	Ductwork natural losses		Lot	IL	dB	-	15	10	3	2	6	8	8	9	
5	Discharge Attenuator Model:B2DM x 500	Primary	2	IL	dB	-	3	8	12	28	26	20	16	14	
6															
7															
8															
9															
10															
11	Revised Sound Power Level:		1	Swl	dB	+	59	59	64	46	46	43	43	37	57
12															
13															
14															
15	Distance to nearest receptor Metres:	r	2		dB	-	14	14	14	14	14	14	14	14	14
16	SPL=SWL -20log(r) + 10log(Q) -11 dB.		Q	2											
17															
18															
19															
20	Spl at receptor				dB	+	45	45	50	32	32	29	29	23	43
21															
22															
23															
24															
25															
26															
27	Specific noise level at receptor				dB	+	45	45	50	32	32	29	29	23	43
28	(1m outside noise sensitive window)														
29	Lowest Background Noise Levels: (L _{A90})														
30	(09:00-22:00)				dB	+									40
31	Difference: (Daytime Assessment level)				dB	-									3
32															

7 Darnley Rd. External Noise Transmission.														
Kitchen Extract System. - Breakout Noise														
NOISE EMISSION CALCULATION														
ITEM	PARAMETER				HZ	63	125	250	500	1K	2K	4K	8K	dBA
1	Schedule of Plant		Qty											
2	Flakt Woods													
3	ESTOC 500	1	Swl	dB	+	74	74	70	59	55	45	39	33	75
4														
5														
6														
7														
8														
9														
10														
11	Revised Sound Power Level:	1	Swl	dB	+	74	74	70	59	55	45	39	33	75
12														
13														
14														
15	Distance to nearest receptor Metres:	r	4	dB	-	20	20	20	20	20	20	20	20	20
16	SPL=SWL -20log(r) + 10log(Q) -11 dB.		Q	2										
17														
18														
19														
20	Spl at receptor			dB	+	54	54	50	39	35	25	19	13	50
21														
22														
23														
24														
25														
26														
27	Specific noise level at receptor			dB	+	54	54	50	39	35	25	19	13	50
28	(1m outside noise sensitive window)													
29	Lowest Background Noise Levels: (L _{A90})													
30	(09:00-22:00)			dB	+									40
31	Difference: (Daytime Assessment level)			dB	-									10
32														

Table 1.

Deane Austin Associates	7 Damley Road, Gravesend.										
System Ref:	SUPPLY										
	Bedroom										
Mid Bad Frequency			63	125	250	500	1K	2K	4K	8K	dBA Hz.
Unit SWL	Titon HRV 1.25 QPlusEco		48	58	60	59	60	53	46	43	65 dB
Based on 66% Duty	Duct Attenuation										
Rectangular Duct	Duct 'W' (mm)	Duct 'L' (M)									
	0	0j	0	0	0	0	0	0	0	0	dB
	0	0	0	0	0	0	0	0	0	0	dB
	0	0	0	0	0	0	0	0	0	0	dB
Rectangular Bends	Bend 'W' (mm)	No of Bends									
	0	0	0	0	0	0	0	0	0	0	dB
	0	0	0	0	0	0	0	0	0	0	dB
	0	0	0	0	0	0	0	0	0	0	dB
Circular Duct	Dia (mm)	Duct 'L' (M)									
	125	4	0.28	0.4	0.4	0.64	1.32	1.32	1.32	1.32	dB
	0	0	0	0	0	0	0	0	0	0	dB
	0	0	0	0	0	0	0	0	0	0	dB
End Reflection.	0.012	0	18	14	9	5	2				dB
% to Grille		50	3	3	3	3	3	3	3	3	dB
Total Duct Losses			21	17	12	9	6	4	4	4	dB
SWL grille			27	41	48	50	54	49	42	39	60 dB
Room Volume m3		24	1	1	1	1	1	1	1	1	dB
Rev Time secs		0.5	3	3	3	3	3	3	3	3	dB
Number of Grilles		1	0	0	0	0	0	0	0	0	dB
SPL rev			23	37	44	46	50	45	38	35	56 dB
			187.0682	4570.882	22908.68	43251.38	92896.64	29376.5	5861.382	2937.65	
Directivity		0.007	3	3	3	4	5	6	7	7	dB
Distance		1	11	11	11	11	11	11	11	11	dB
SPL dir			13	27	34	35	38	32	24	21	44 dB
			18.70682	457.0882	2290.868	3435.579	5861.382	1472.313	233.3458	116.9499	
Combined:	SPL rev + SPL dir		23	37	44	47	50	45	38	35	57 dB
Combined Rev & Direct +3			26	40	47	50	53	48	41	38	60 dB
Criteria: Bedroom:	NR	25	55	44	35	29	25	22	20	18	35 dB
Attenuation required:			-29	-4	12	21	28	26	21	20	1 dB
Attenuator:: SP125	125i/s-250o/d	900 long	9	11	20	38	41	38	35	31	dB
Resultant Level:	SUPPLY		17	29	27	12	12	10	6	7	22 dB
E&OE											

Table 2

Deane Austin Associates	7 Damley Road, Gravesend.										
System Ref:	EXTRACT										
	Titon HRV 1.25 QPlusEco		T								
Mid Bad Frequency			63	125	250	500	1K	2K	4K	8K	dBA Hz.
Unit SWL			43	52	45	43	45	36	29	26	49 dB
Based on 66% Duty	Duct Attenuation										
Rectangular Duct	Duct 'W' (mm)	Duct 'L' (M)									
	0	0	0	0	0	0	0	0	0	0	dB
	0	0	0	0	0	0	0	0	0	0	dB
	0	0	0	0	0	0	0	0	0	0	dB
Rectangular Bends	Bend 'W' (mm)	No of Bends									
	0	0	0	0	0	0	0	0	0	0	dB
	0	0	0	0	0	0	0	0	0	0	dB
	0	0	0	0	0	0	0	0	0	0	dB
Circular Duct	Dia (mm)	Duct 'L' (M)									
	125	8	0.56	0.8	0.8	1.28	2.64	2.64	2.64	2.64	dB
	0	0	0	0	0	0	0	0	0	0	dB
	0	0	0	0	0	0	0	0	0	0	dB
	0	0	0	0	0	0	0	0	0	0	dB
End Reflection.	0.012	0	18	14	9	5	2				dB
% to Grille		50	3	3	3	3	3	3	3	3	dB
Total Duct Losses			22	18	13	9	8	6	6	6	dB
SWL grille			21	34	32	34	37	30	23	20	43 dB
Room Volume m3		24	0	0	0	0	0	0	0	0	dB
Rev Time secs		0.5	3	3	3	3	3	3	3	3	dB
Number of Grilles		1	0	0	0	0	0	0	0	0	dB
SPL rev			18	31	29	31	34	27	20	17	40 dB
			69.82324	1318.257	831.7638	1180.321	2728.978	544.5027	108.6426	54.45027	
Directivity		0.007	3	3	3	4	5	6	7	7	dB
Distance		1	11	11	11	11	11	11	11	11	dB
SPL dir			13	26	24	27	31	25	19	16	38 dB
			22.08005	416.8694	263.0268	469.8941	1367.729	343.5579	86.29785	43.25138	
Combined:	SPL rev + SPL dir		20	32	30	32	36	29	23	20	42 dB
Combined Rev & Direct +3			23	35	33	35	39	32	26	23	45 dB
Criteria: Bed /Bath:	NR	25	55	44	35	29	25	22	20	18	35 dB
Attenuation required:			-32	-9	-2	6	14	10	6	5	dB
Attenuator:: SP125	125i/s-250o/d	300 long	3	3	6	15	21	23	23	18	dB
Resultant Level:			20	32	27	20	18	9	3	5	22 dB
E&OE											