

FIELD END ROAD

Eastcote

Noise Assessment

April 2020

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1. INTRODUCTION

1.1. Overview

NRG Consulting has been commissioned to undertake a noise assessment of the existing and proposed mechanical ventilation system and air conditions units at an existing restaurant at 105 Field End Road, Eastcote.

The following technical noise assessment has been produced to provide supporting information to accompany a planning application to the London Borough of Hillingdon and is based upon environmental noise measurements undertaken at the site.

The scope of the noise assessment can be summarised as follows:

- An attended baseline sound monitoring survey undertaken in the vicinity of the closest noise-sensitive receptors to the Site;
- An assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the proposed sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England: Noise¹ and BS4142:2014+A1:2019².

¹ Department for Communities and Local Government (DCLG), 2014. National Planning Practice Guidance for England: Noise. DCLG.

² British Standard Institution. BS4142:2014+A1:2019: Methods for rating and assessing industrial and commercial sound.

2. ASSESSMENT FRAMEWORK – BRITISH STANDARDS

2.1. National Policy

2.1.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF)³ sets out the Government's planning policies for England. Planning policy requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise.

The NPPF is also a material consideration in planning decisions. It sets out the Government's requirements for the planning system and how these are expected to be addressed.

Under Section 15; Conserving and enhancing the natural environment, the following is stated:

"The planning system should contribute to and enhance the natural and local environment by:

- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability".*

The document goes on to state:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;"*

As stated above, this document makes reference to avoiding noise generation from new developments that would adversely impact on health and quality of life.

2.1.2. Noise Policy Statement for England, 2010

The underlying principles and aims of existing noise policy documents, legislation and guidance are clarified in DEFRA: 2010: Noise Policy Statement for England (NPSE)⁴. The NPSE sets out the "Long Term Vision" of Government noise policy as follows:

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

The NPSE outlines three aims for the effective management and control of environmental, neighbour and neighbourhood noise:

- *"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 guidance states that it is not possible to have a single objective noise-based measure that defines "Significant Observed Adverse Effect Level (SOAEL)" that is applicable to all sources of noise in all situations

³ Ministry of Housing, Communities & Local Government. February 2019. National Planning Policy Framework. HMSO. London.

⁴ Department for Environment, Food and Rural Affairs (DEFRA), 2010. Noise Policy Statement for England. DEFRA.

and that not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

2.1.3. National Planning Practice Guidance in England: Noise 2019 (PPGNoise)

Paragraph: 002 of the PPGNoise states the following:

“Can noise override other planning concerns?”

It can, where justified, although it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect on whether noise is likely to pose a concern.”

As such, Paragraph: 003 of the NPPG states that:

“Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

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

In line with the Explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure ... is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.”

Consequently, the *National Planning Practice Guidance in England: Noise* (NPPG Noise)⁵ summarises the noise exposure hierarchy, based on the likely average response. The following three observed effect levels are identified below, as identified in Paragraph 004:

- Significant Observed Adverse Effect Level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- Lowest Observed Adverse Effect Level: This is the level of noise exposure above which adverse effects on health and quality of life can be detected; and
- No Observed Adverse Effect Level: This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Importantly, Paragraph: 004 of the PPGNoise states that:

“Although the word ‘level’ is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs.”

Paragraph: 005 of the PPGNoise expands the significant criteria related to each of these levels, which are reproduced in Table 1, below.

⁵ Department for Communities and Local Government (DCLG), 2019. National Planning Practice Guidance for England: Noise. DCLG.

Table 1: Significance Criteria from NPPG in England: Noise

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

2.2. British Standards

2.2.1. BS4142:2014+A1:2019

BS4142:2014+A1:2019 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014+A1:2019 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014+A1:2019 states: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs"*. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- *"Typically, the greater this difference, the greater the magnitude of the impact."*
- *"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."*
- *"A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."*
- *"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

Interpreting the guidance given in BS4142:2014+A1:2019, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a **Significant Observed Adverse Effect Level**;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a **Lowest Observed Adverse Effect Level**;
- The lower the rating sound 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 sound level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, and would therefore be classified as a **No Observed Adverse Effect Level**.

During the daytime, the assessment is carried out over a reference time period of 1-hour, with the night-time assessment being carried out over a reference period of 15 minutes. The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

2.3. Local Plan

The London Borough of Hillingdon's "Noise – Supplementary Planning Document" provides the following guidance for the assessment of plant noise:

"British Standard 4142:1997 gives advice on measuring and assessing the noise from machinery or plant and is relevant if surrounding residential areas might be affected. Developments with a BS4142 assessment of marginal significance or above would not ordinarily be permitted. Consequently, the development should be controlled such that the rating level of the noise from the proposed development determined according to BS4142 is at least 5 dB below the background noise level $L_{A90,T}$. Ideally, the assessment of noise should give a positive indication that complaints are unlikely."

Further to this, in an email on Friday 31st Jan 2020 at 18:36 from Monica Mulowoza, Planning Officer from London Borough of Hillingdon Council, has stated the following:

"There is no information on the noise output of the new external flues, in order to protect the amenity of the nearest adjoining neighbours the level of noise emanating from the extended flue shall be provided. The control system should meet the requirements laid down in BS4142: 2014 Methods for rating and assessing industrial and commercial sounds."

Therefore, the assessment will be carried out in accordance with BS4142:2014, which has been amended in 2019.

3. SITE DESCRIPTION

3.1. Site and Surrounding Area

The site is located at 105 Field End Road, Eastcote, HA5 1QG. The development area, location of the proposed plant and the nearest noise sensitive receptors (NNSR) can be seen in Figure 1, below.

The ambient sound environment surrounding the site consisted mainly distant road traffic, general urban hum.

Figure 1: Proposed Development Site, Surrounding Area and NNSR's



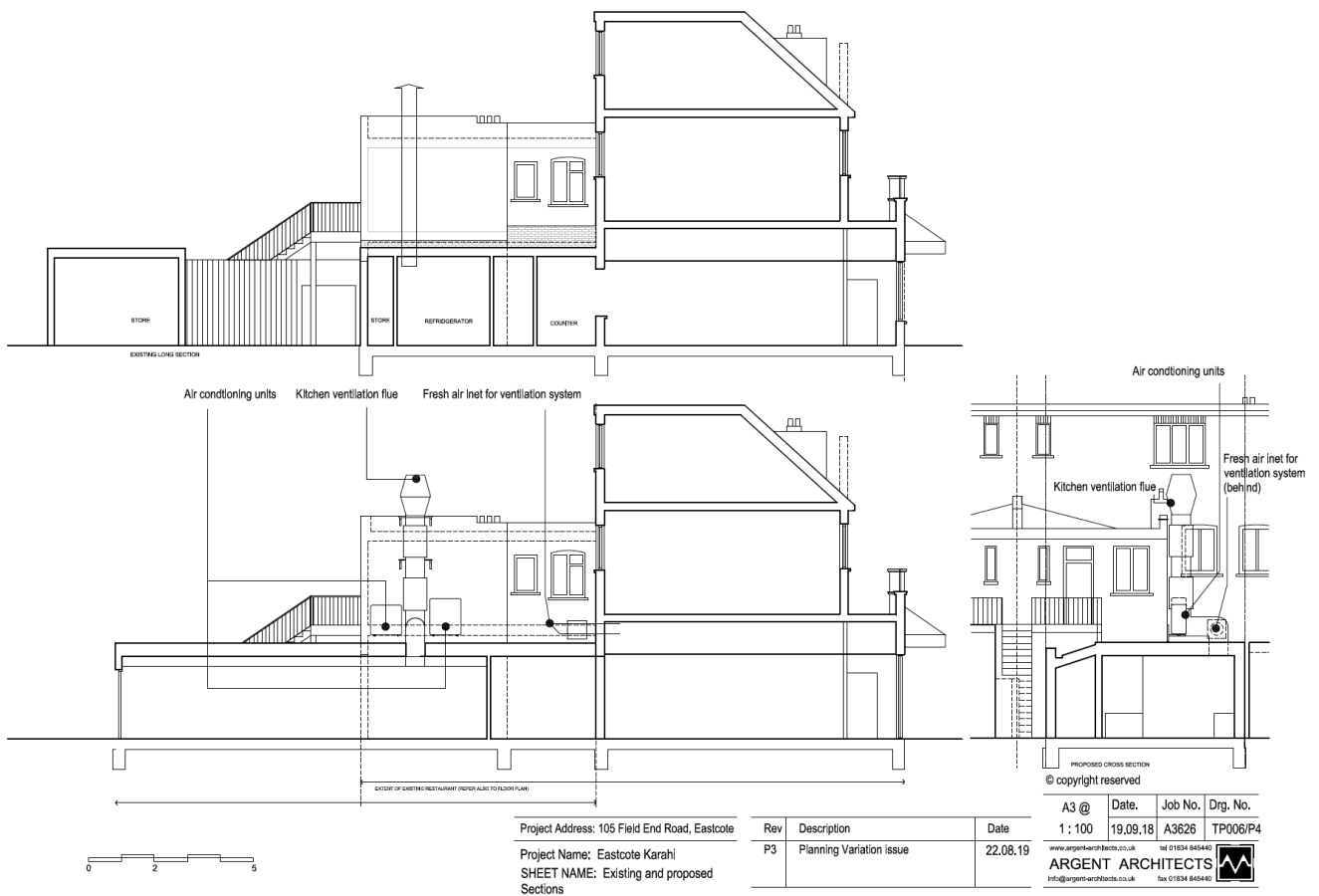
3.2. Proposed Development Overview

The proposals are to install 2 air conditioning units, a new kitchen extraction fan and associated ductwork, a restaurant seating area extraction fan and a fresh air supply to the kitchen. The proposals can be seen below in Figure 2 and Figure 3.

Figure 2: Existing and Proposed Rear Elevations



Figure 3: Existing and Proposed Sections



4. MEASUREMENT METHODOLOGY

4.1. General

The prevailing noise conditions in the area have been determined by an attended environmental noise survey conducted during both daytime and night-time periods between 18:45pm on 12th March to 08:20am on 13th March 2020. Attended Measurements also taken on site to as part of a source determination exercise.

4.2. Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445⁶.

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672⁷. A full inventory of this equipment is shown in Table 2 below.

Table 2: Inventory of Sound Measurement Equipment

Unit	Make, Model & Description	Serial Number
MP1 (Partially Attended)	Svantek 957 Sound Level Meter	21890
	Svantek SV 12L Preamplifier	24215
	ACO 7052E Microphone	58524
MP2 (Attended)	Rion NL-52 Sound Level Meter	00764926
	Rion NH-25 Preamplifier	65324
	Rion UC-59 Microphone	10223
Both	Larson Davis CAL200 Acoustic Calibrator	15314

The sound measurement equipment used during the survey was field calibrated at the start and end of the measurement period. A calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements. A drift of less than 0.1 dB in the field calibration was found to have occurred on all sound level meters.

4.3. Weather

The weather conditions during the survey were conducive to noise measurement, it being dry, with low wind speeds. Weather conditions during the measurements were monitored during regular site visits.

The microphones were fitted with protective windshields for the measurements, which are described in Table 3 with an aerial photograph indicating its respective location shown in Figure 4.

⁶ British Standard 7445: 2003: Description and measurement of environmental noise. BSI

⁷ British Standard 61672: 2003: Electroacoustics. Sound level meters. Part 1 Specifications. BSI.

4.4. Measurement Locations

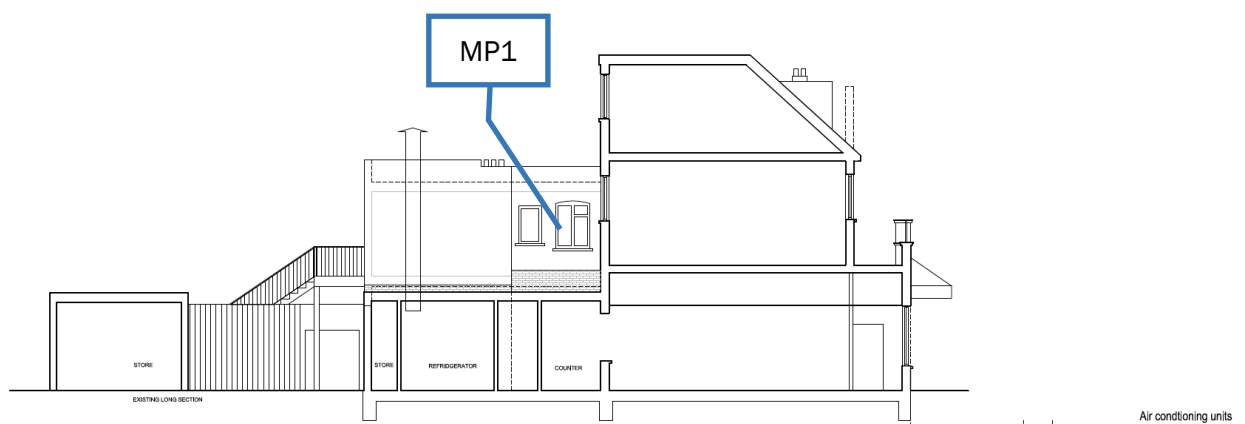
Table 3: Measurement Position Descriptions

Measurement Position	Description
MP1	A partially attended measurement of ambient sound at the nearest noise sensitive receptor. The microphone was located on the first floor roof above the restaurant as detailed on the map below, and Figure 5. The microphone was situated at a height of 1.5m above the roof level and was approximately 1m away from the window of the nearest receptor. The ambient noise levels within the area consisted of distant road traffic, construction noise from nearby sites in the day time and noise arising from other ventilation systems to the rear of the neighbouring commercial buildings.
MP2	Attended measurements of the existing plant equipment. The measurements were taken as a source determination exercise, in order to understand the emissions arising from the individual units.

Figure 4: Measurement Positions



Figure 5: Measurement Position – Existing Sections



The summarised results of the environmental noise measurements are presented in Table 4, with the time history analyses presented under Appendix B.

Table 4: Summary of Uncorrected Noise Measurement Results

Measurement Position	Period	Noise Level, dB			
		L _{Aeq,T}	L _{Amax}	L _{A10}	L _{A90}
MP1	Typical Usage (Helios Fan off) Daytime 1 Hour 22:00-23:00	49.1	66.7	50.5	47.0
	Typical Usage (Helios Fan off) Night time 15 Minutes 23:40-23:55	48.4	54.2	50.0	46.5
	Typical Usage and Helios Fan On	55.1	61.9	55.8	54.2
	All Plant Off – Shoulder Period 15 Minutes 00:00-00:15	37.5	56.2	39.7	32.1

5. ASSESSMENT OF COMMERCIAL SOUND – BS4142 ASSESSMENT

5.1. Introduction

The existing mechanical plant located on the roof of the existing restaurant is to be assessed in accordance with BS4142:2014+A1:2019 to determine the impact of the noise at the receptor using the measured results from the partially attended noise survey. Due to the outcome of the initial survey results, which indicate that the existing plant will incur a 'Significant Observed Adverse Effect Level (SOAEL)', a source determination exercise has been performed to determine which individual items of plant are causing the exceedances.

Mitigation advice will be provided where necessary to ensure that the mechanical plant will comply with the stipulated requirements of the local planning authority. Where it has not been possible to measure the air conditioning units, a combination of measured and predicted data has been used. A predictive assessment of the sound levels associated with the plant, including the proposed mitigation options has been undertaken to demonstrate compliance with the relevant design criteria.

5.2. Proposed Plant Description and Source Data

The proposed equipment and associated measured and manufacturer broadband data is outlined below:

Table 5: Items of proposed plant and associated measured and manufacturer broadband data

Description	Measured Data		Manufacturer Data	
	L _{Aeq, T}	L _{A90}	dBA	L _w
Woods 56 Maxfan Compac Axial Fan – Case Breakout	48 @ 3m	47 @ 3m	48 @ 3m	98
Woods 56 Maxfan Compac Axial Fan – Outlet	-	-	72 @ 3m	98
Helios Restaurant Extract	56	54	-	-
Daikin AZQS71B2V1B AC Units - Cooling	-	-	48 @ 1.8m	64
Daikin AZQS71B2V1B AC Units - Heating	-	-	50 @ 1.8m	-
Daikin AZQS71B2V1B AC Units – Night Mode	-	-	43 @ 1.8m	-
Kitchen Fresh Air Supply	76	75	-	-

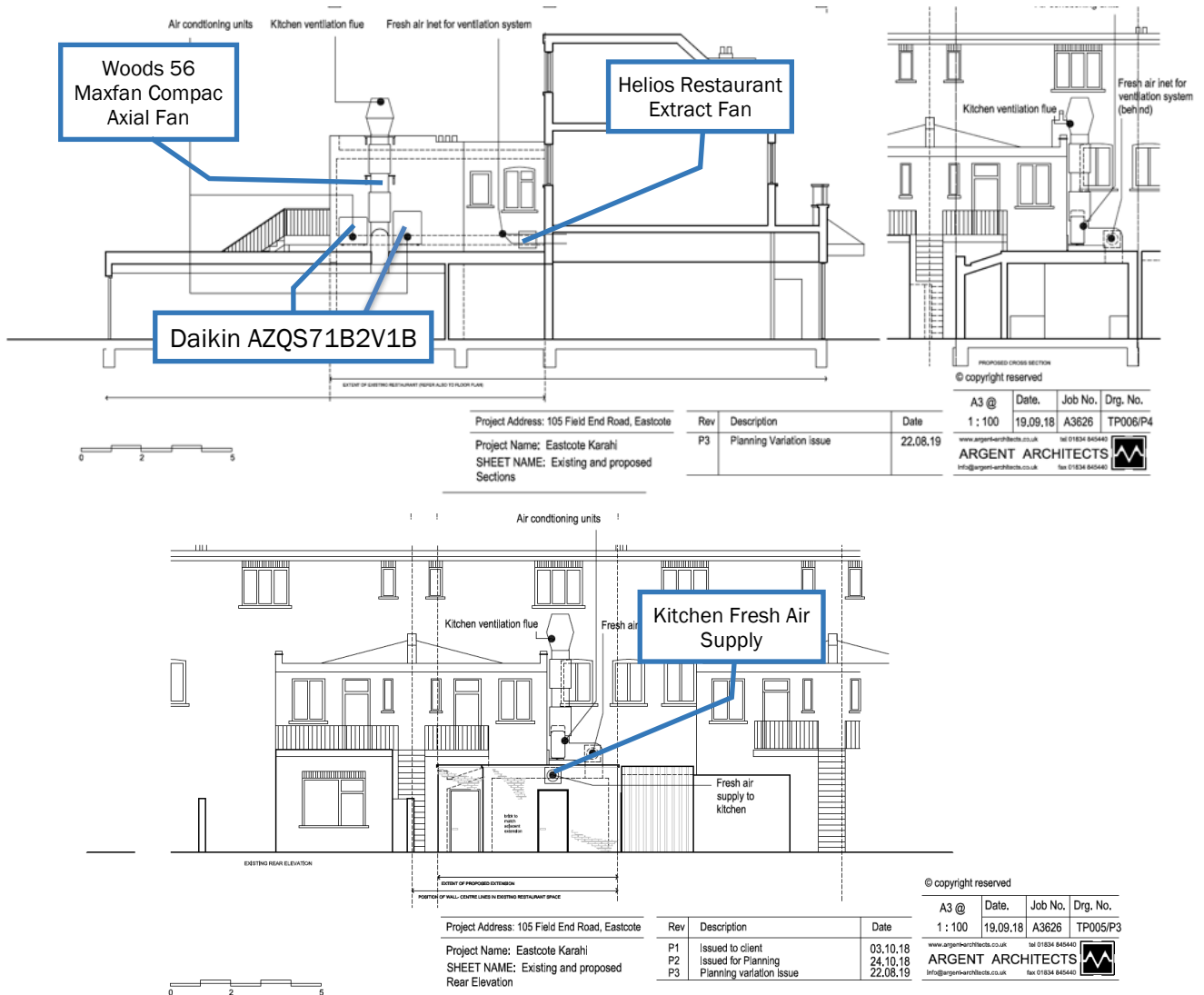
The Daikin AC Units have been measured in free field radiation directivity by the manufacturer.

The octave band Sound Power Level provided by the manufacturer for the axial fan is presented below.

Table 6: Axial Fan – Source Octave Band Data

Source	Octave Band Sound Power Level, Hz (dB)							
	63	125	250	500	1000	2000	4000	8000
Woods 56 Maxfan Compac Axial Fan – Outlet	87	95	89	90	88	85	80	79

Figure 6: Noise Sources - Locations



5.3. Specific Sound Level Summary – Existing Plant

The specific sound level for the combined usage of the existing mechanical plant, has been calculated, on the basis of the measured statistics set out in Table 4. The Helios fan system has been calculated separately.

The specific sound level, as calculated from the measured ambient and residual sound levels is set out in Table 7.

Table 7: Specific Sound Level Summary

Position	Period	Specific Sound Level – dB(A)
MP1	Typical Usage (Helios Fan off) Night time - 15 Minutes 23:40-23:55	48
	Typical Usage and Helios Fan On	55

5.4. Rating Penalty Principle

Section 9 of BS4142:2014+A1:2019 describes how the rating sound level should be derived from the specific sound level, by determining a rating penalty.

BS4142:2014+A1:2019 states:

“Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method.”*

The subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014+A1:2019, which states:

“Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.

Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources.”

BS4142:2014+A1:2019 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

Tonality

A rating penalty of +2 dB is applicable for a tone which is “just perceptible”, +4 dB where a tone is “clearly perceptible”, and +6 dB where a tone is “highly perceptible”.

Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is “just perceptible”, +6 dB where it is “clearly perceptible”, and +9 dB where it is “highly perceptible”.

Other Sound Characteristics

BS4142:2014+A1:2019 states that where *“the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied.”*

5.5. Rating Penalty Assessment

Considering the above, an assessment of the on-site commercial noise sources influencing the nearest residential receptors, in terms of whether any rating penalties are applicable, has been detailed in Table 8.

Table 8: Rating Penalty Assessment

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristic	Discussion
Ventilation Systems	0 dB	0 dB	0 dB	+3 dB	The noise source is neither Tonal, Impulsive or Intermittent. However, the fans could be clearly heard over the residual sound environment. Therefore, a 3 dB rating penalty for other sound characteristics have been applied.

In summary, a rating penalty of +3 dB has been included in the assessment of commercial noise.

5.6. Uncertainty

BS4142:2014+A1:2019 requires that the level of uncertainty in the measured data and associated calculations is considered in the assessment. The Standard recommends that steps should be taken to reduce the level of uncertainty.

Measurement Uncertainty

BS4142:2014+A1:2019 states that measurement uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

- “
- ... b) the complexity and level of variability of the residual acoustic environment;
 - ... d) the location(s) selected for taking the measurements;
 - ... g) the measurement time intervals;
 - h) the range of times when the measurements have been taken;
 - i) the range of suitable weather conditions during which measurements have been taken;
 - ... k) the level of rounding of each measurement recorded; and
 - l) the instrumentation used.”

Each of the measurement uncertainty factors outlined above have been considered and discussed in Table 9.

Table 9: Measurement Uncertainty Factors

Measurement Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Residual acoustic environment is relatively constant.
d)	0 dB	The measurements were undertaken at the closest point of the site to the off-site sources of commercial sound.
g)	0 dB	Measurement time intervals were set in accordance with BS4142:2014+A1:2019, hence no further correction needs to be made.
h)	0 dB	Measurements were undertaken over attended daytime and night-time periods.
i)	0 dB	The attended nature of the measurement enabled detailed observations of the weather conditions and no periods of significant wind or precipitation were noted.
k)	0 dB	Measured values were rounded to 0.1 dB, therefore rounding would not have had a significant impact on the overall typical background sound levels.
l)	0 dB	The acoustic measurement equipment accorded with Type 1 specification of British Standard 61672, and were deployed with appropriate wind shields.

In summary, a correction of 0 dB has been included to account for measurement uncertainty.

5.7. BS4142:2014+A1:2019 Assessment – Existing Equipment

The rating sound levels, as calculated from the derived specific sound levels, have been assessed in accordance with BS4142:2014+A1:2019.

The BS4142:2014+A1:2019 assessment at MP1, can be seen in Table 10 and Table 11. Where an assessment of all of the fans except the Helios restaurant extract fan has been undertaken in Table 10. An assessment of all of when all of the plant including the Helios restaurant extract fan is on, detailed in Table 11.

The assessment has been assessed to the night-time background sound levels to represent a worst-case scenario, as it was not possible to measure a representative background during the operation of the restaurant. The shoulder period has been used to determine a representative background sound level after the restaurant shut at 00:00am.

Table 10: BS4142:2014+A1:2019 Assessment of typical usage of plant excluding the Helios restaurant extract

Results	Sound Level (dB)	Notes
Specific Sound Level	48	As shown in Table 7.
Rating Penalty	+3	As discussed in Table 8.
Measurement Uncertainty	0	As discussed in Table 9.
Rating Sound Level	51	-
Background Sound Level	32	As shown in Table 4
Excess of Rating over Background Sound Level	+19	Assessment indicates a potentially “Significant Adverse Impact”

Table 11: BS4142:2014+A1:2019 Assessment of typical usage of plant including the Helios restaurant extract

Results	Sound Level (dB)	Notes
Specific Sound Level	55	As shown in Table 7.
Rating Penalty	+3	As discussed in Table 8.
Measurement Uncertainty	0	As discussed in Table 9.
Rating Sound Level	58	-
Background Sound Level	32	As shown in Table 4
Excess of Rating over Background Sound Level	+26	Assessment indicates a potentially “Significant Adverse Impact”

5.8. Discussion and Context

As can be seen from the results of the assessment, it concludes that the existing system causes a ‘*Significant Observed Adverse Effect Level (SOAEL)*’. Mitigation options are provided in the following section, which will ensure that the noise levels arising from the plant are reduced, such that they meet the requirements of 5dB below background sound at the nearest noise sensitive receptor.

6. MITIGATION

The following mitigation options have been provided to mitigate the noise impact at the nearest noise sensitive receptors.

6.1.1. Case Breakout

Whilst on site, it was noted that noise was clearly audible from the case break out of the 'Woods 56 Maxfan Compac Axial Fan'; this is clearly the main source of noise dominating the ambient noise levels. Therefore, in order to mitigate case breakout noise, it is suggested that the fan should be located inside the building and underneath the roof; or in a suitable acoustic enclosure should be installed, such that it provides 29dB(A) of attenuation. The Helios restaurant extract fan should also be located within the building and ducted out of the wall.

6.1.2. Daikin AZQS71B2V1B AC Units

The manufacturer information states that the free field sound pressure level at 1.8m is 50dB for heating. The nearest window is 3m away from one of the units, and 4 m from the other unit, resulting in a cumulative sound pressure level at the nearest receiver of 53dB(A), assuming quarter-spherical radiation. A suitable enclosure should be installed around the units to provide 27dB(A) of attenuation and it is suggested that the units should be set to 'Night Mode' after 11pm, which provides a further 7dB(A) decrease in sound levels.

A suitable enclosure can be found here: <http://tiny.cc/hnlxnz>.

6.1.3. Helios Restaurant Extraction Fan

The sound pressure level at the cowl of the ductwork for this fan has been measured to be 55dBA at 2m. Silencers should be installed after the outlet (i.e. on the environmental side of the fan) to reduce the broadband sound level by 36dB(A).

It is suggested that the system is redesigned such that the fan is replaced with alternative fan that is quieter, or utilising multiple silencers that would provide enough attenuation to total 36dB(A) of reduction when combining all elements.

6.1.4. Kitchen Fresh Air Supply Fan (Above Ground Floor Door)

The fresh air kitchen supply was measured to be 76dB(A) at 2.5m. The fan should be moved inside the building and the sound levels need to be attenuated by 32dB(A) by means of a silencer or a louvered panel. If this is not possible, the fan should be replaced with another that provides a sound pressure level of 52dB(A) at 1m.

6.1.5. Main Kitchen Extraction System

On the assumption that the fan has been moved within the building to reduce case breakout, the following calculations of the noise emissions arising from Axial Fan and associated ductwork have been detailed below in order to determine the specific sound level at the receptor.

Table 12: Kitchen Extract Calculations - Woods 56 Maxfan Compac Axial Fan

Source	Octave Band Sound Level, Hz (dB)							
	63	125	250	500	1000	2000	4000	8000
SWL of Fan	87	95	89	90	88	85	80	79
Duct Attenuation (Total)	2	2	0	0	0	0	0	0
Bend Attenuation (1)	0	0	1	2	3	3	3	3
Bend Attenuation (2)	0	0	1	2	3	3	3	3
Acoustica Silencer (1)	2	3	6	14	14	12	10	5
Acoustica Silencer (2)	2	3	6	14	14	12	10	5
Grille Attenuation	9	5	2	0	0	0	0	0
SWL @ Louvre	71	81	69	54	49	49	48	57

Specific details of the Acoustic Silencer have not been provided; therefore it has been assumed that the worst performing model has been used for the 500mm range, to ensure a worst case scenario. The product code of the assumed silencer is CP03-C*-0500-1D.

It has been assumed that the radiation of the Cowl is spherical, due to there being no horizontal reflective surfaces in close proximity to the grille of the extract system. The distance from the grille to the Residential Receiver has been measured to be 5.5 m.

The specific sound level at the receptors from the extract system is therefore L_{Aeq} 44 dB.

The specific sound level is 24 dB(A) over the Rating Noise Limit at the receptor. Therefore, it is required to mitigate the sound level by 24dB(A).

The following insertion loss has been provided below in order to reduce the sound levels by the required amount.

Table 13: Insertion Loss

Source	Octave Band Sound Level, Hz (dB)							
	63	125	250	500	1000	2000	4000	8000
Insertion Loss Requirement	5	26	22	13	13	17	18	29

This insertion loss requirement is typically achieved with the alteration and insertion of suitably selected silencers.

7. ASSESSMENT OF NOISE AFTER MITIGATION

7.1. Specific Sound Level Summary – After mitigation

Providing that the recommended mitigation options will be implemented, the cumulative sound pressure level of each item of plant (assuming all fan cases have been moved inside the building) is 26dB(A) at the receiver.

Table 14: Specific Sound Level Summary – After Mitigation

Position	Specific Sound Level – dB(A)
NNSR1	26

7.2. Rating Penalty Assessment

Due to the inaudibility of the sound levels at the receptor over the ambient sound environment, no correction has been applied.

7.3. BS4142 Assessment

The BS4142:2014+A1:2019 assessment at MP1, can be seen in Table 15.

The assessment has been assessed to the night-time background sound levels to represent a worst-case scenario, as it was not possible to measure a representative background during the operation of the restaurant. The shoulder period has been used to determine a representative background sound level after the restaurant shut at 00:00am.

Table 15: BS4142:2014+A1:2019 Assessment of all plant operating during the night time period

Results	Sound Level (dB)	Notes
Specific Sound Level	26	As shown in Table 14.
Rating Penalty	0	As discussed in Section 7.2
Measurement Uncertainty	0	As discussed in Table 9
Rating Sound Level	26	-
Background Sound Level	32	As shown in Table 4
Excess of Rating over Background Sound Level	-6	Assessment indicates a potentially “Low Impact”

It can be seen that the assessment indicates a Low Impact as a result of the proposed mitigation measures, as well as complying with the requirements of the Local Plan.

8. CONCLUSION

NRG Consulting has been commissioned to assess the impact of noise at 105 Field End Road, Eastcote, HA5 1QG.

A technical noise assessment has been produced to provide supporting information to accompany a planning application to London Borough of Hillingdon and is based upon environmental noise measurements undertaken at the site.

The assessment of the existing extract system and additional plant are likely to have a **Significant Observed Adverse Effect Level** (SOAEL) at the nearest receptors. Mitigation advice has been provided to reduce the noise levels for the proposed system which indicates that the sound emissions associated with the Proposed Development are likely to have a low impact at the nearest receptors, which equates to an impact of no greater than the *No Observed Adverse Effect Level* (NOAEL) after the mitigation advice has been implemented.

In light of the above, which demonstrates that the site is predicted to meet the requirements of the relevant planning guidance, it is considered that noise does not present a constraint to the granting of planning permission for the Proposed Development subject to the implementation of the recommended mitigation measures.

9. APPENDICES

9.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s ₁ and s ₂ is given by 20 log ₁₀ (s ₁ / s ₂). 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.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
L _{eq,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 during the 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 _{90,T}	A noise level index. The noise level exceeded for 90% of the time over the period T. L ₉₀ can be considered to be the "average minimum" noise level and is often used to describe the background noise.
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.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 16: Typical Sound Levels found in the Environment

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} .

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1\text{hour}}$ dB and $L_{A90,15\text{mins}}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

9.2. Appendix B – Measurement Results

Figure 7: Measured Time History – MP1

