

Proposed Kitchen Plant

103 Basingstoke Road, Reading RG2 0HA



Noise Impact Assessment

TECHNICAL REPORT

36804-R3

Proposed Kitchen Plant

Noise Impact Assessment

Prepared for: Jamal Kayani c/o 103 Basingstoke Road, Reading RG2 0HA

Site location: 103 Basingstoke Road, Reading RG2 0HA

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1 INTRODUCTION

- 1.1 A development has been proposed at 103 Basingstoke Road, Reading RG2 0HA (hereinafter, “The Site”). A plan highlighting the boundary of The Site has been provided in Appendix B with development proposal drawings in Appendix C.
- 1.2 This document has been prepared to accompany a planning application to Reading Borough Council (planning application number 210283) for the *installation of air extraction and supply system* in relation to a proposed A3 restaurant establishment.
- 1.3 The nearest noise sensitive location (NSL) to the proposed extraction and supply plant has been noted as follows:
- NSL 1: rear first floor residential window (closest receptor nominally 7.5 m relative to the supply intake at lower roof level).
 - NSL 2: rear second floor residential window (closest receptor nominally 3 m relative to the extract termination at top roof level).
 - NSL 3: Residential windows on the north elevation of the 4-storey residential flats to the south of the site (nominally 12 m relative to the wall mounted extract fan).
- 1.4 The noise sensitive locations have been indicated in the drawings in Appendix C. It has been noted that the window on the south (side elevation) closest to the proposed extract fan is a kitchen (with no dining area) and has therefore not been considered a habitable room for the purposed of assessment, where the definition of ‘habitable room’ is generally defined as bedrooms, living rooms, or kitchens with dining areas. The residential floor plan has been provided in Appendix C.
- 1.5 The proposal has been considered in line with daytime and evening operating periods to coincide with the business operating hours understood to be proposed for daytime and evening, until 23:00 hours.
- 1.6 This report provides an amended assessment following the original noise impact assessment planning submission, following changes to the plant services equipment selection and revised layout.
- 1.7 A Glossary of Acoustic Terms has been provided in Appendix A that may assist with the terminology used within this report.

2 NOISE CRITERIA

READING BOROUGH COUNCIL LOCAL PLAN (2019)

2.1 EN17 of the Reading Borough Council Local Plan (adopted November 2019) states the following:

EN17: NOISE GENERATING EQUIPMENT

Where noise generating equipment is proposed, the noise source specific⁶¹ level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor.

2.2 It has been noted that the following condition may be applied to the proposed plant noise emissions, from the Reading Brough Council internal memo from Ross Jarvis to Davit Brett (dated 28 July 2021) following the submission of the noise impact assessment 36804 R1:

N8 NOISE LEVELS OF PLANT/EQUIPMENT RESTRICTED

The specific sound level of the plant/equipment hereby approved, ($L_{Aeq,TR}$) (with reference to BS:4142) as measured at a point 1 metre external to the nearest noise-sensitive facade shall be at least 10dB below the pre-existing background sound level, $LA_{90,T}$ when all plant/equipment (or any part of it) is in operation. The rating level, $L_{A,r,r}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to the nearest noise-sensitive façade (habitable window of a dwelling) shall not exceed the pre-existing background sound level, $LA_{90,T}$ when all plant/equipment (or any part of it) is in operation.

REASON: To safeguard the amenities of the adjoining premises and the area generally, in accordance with Policy CC8 and EN17 of the Reading Borough Local Plan 2019.

NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

2.3 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 June 2019.

2.4 The Framework replaced most planning policy, circulars and guidance including Planning Policy Guidance 24: Planning and Noise (1994). The NPPF defines the Government's planning policies for England and sets out the framework, within which local authorities must prepare their local and neighbourhood plans, reflecting the needs and priorities of their communities. The Government's stated purpose in producing the NPPF was to streamline policy so the planning process is less restrictive, to give a more easily understood framework for delivering sustainable development.

2.5 Under the heading of "Conserving and Enhancing the Natural Environment", specific noise pollution aims are detailed in Section 170 of the NPPF. It is stated 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, or being adversely affected by, unacceptable levels of ... noise pollution...”

2.6 Considering “Ground Conditions and Pollution” it is also stated in Section 180 of the NPPF that planning policies and decisions should also ensure that any new development is appropriate for its location considering the likely effects of pollution on health, living conditions, the natural environment, sensitivity of the site and wider area and impacts that could arise from the development. The aims in doing so 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;
- identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.7 It is stressed that the above references to noise should not be considered in isolation and that the theme, referred to as the “golden thread” of sustainability that runs through the NPPF is integral to noise.

2.8 The NPPF acknowledges that there is a host of existing sources of national and international guidance which can be used, in conjunction with the Framework, to inform the production of Local Plans and decision making.



NOISE POLICY STATEMENT FOR ENGLAND (NPSE)

2.9 The Noise Policy Statement for England (NPSE) was published in March 2010. It sets out the long-term vision of government noise policy, which is fundamentally to: “Promote good health and good quality of life through the effective management and control of noise within the context of Government policy on sustainable development”. The vision is supported by three key aims:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and reduce to a minimum, other adverse impacts on health; and
- Where possible, contribute to the improvement of health and quality of life.

2.10 The NPSE should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise but does not apply to noise in the workplace. The NPSE adopts the following concepts, to help consider whether noise is likely to have “significant adverse” or “adverse” effects on health and quality of life:

SOAEL – Significant Observed Adverse Effect Level.

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

LOAEL – Lowest Observed Adverse Effect Level.

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

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.

2.11 The NPSE emphasises that:

“It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available (Defra, 2010).”



NATIONAL PLANNING PRACTICE GUIDANCE (PPG)

2.12 Revised Planning Practice Guidance was released in March 2014 to support the NPPF and last updated in July 2019. The Guidance stipulates that Local Planning Authorities' plan making and decision making should 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.

2.13 The table below is in the Guidance to assist recognising "when noise could be a concern".

Perception	Examples of Outcomes	Increasing Effect Level	Action
Unnoticeable	No Effect	NOEL	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	
		LOAEL	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for sleep disturbance. Affects acoustic character of the area and creates a perceived change in quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		SOAEL	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 – Planning Practice Guidance to Support National Planning Policy Framework.

BS 4142:2014+A1:2019 METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

- 2.14 The British Standard BS 4142:2014 +A1:2019 “Methods for Rating and Assessing Industrial and Commercial Sound” describes methods for rating and assessing sound of an industrial or commercial nature. The scope of the standard includes relevant topics for commercial development, such as sound from fixed installations (mechanical and electrical plant and equipment). The standard is applicable to the determination of rating levels for sources of sound as well as ambient, background and residual levels. The Standard was amended in June 2019.
- 2.15 Certain acoustic features can increase the significance of impact that might be expected from a comparison of the specific sound level to the background sound level where these features are likely to affect perception and response. Where such features are present at the assessment location, a character correction (or penalty) to the specific sound level is made to obtain the rating level. This can be approached from subjective, objective and reference methods.
- + Tonality: A correction of 0dB to +6dB for sound ranging from not tonal to prominently tonal.
 - + Impulsivity: A correction of up to +9dB can be applied for sound that is impulsive.
 - + Intermittency: A penalty of +3dB can be applied if on/off conditions are readily distinctive within the reference time interval over the period of the greatest amount of on-time.
 - + Other characteristics: A penalty of +3dB can be applied in the absence of all other defined characteristics, where the specific sound contains a distinctive feature in the residual acoustic environment.
- 2.16 Character corrections are normally added arithmetically where more than one feature is present, however, if any single feature is dominant to the exclusion of others, then it may be appropriate to reduce the correction or apply a zero correction for the minor characteristics. The rating sound level is equal to the specific sound level if there are no acoustic features present or expected to be present.
- 2.17 The significance of sound depends upon both the margin by which the rating level exceeds the background sound level and the context in which the sound occurs. An initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level. The context of the development is important in assessing the impact.
- Typically, the greater this difference, the greater the magnitude of the impact.
 - A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context. A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.
 - The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or significant adverse



impact. Where the rating level does exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

- 2.18 The scope of the Standard recognises that human response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact can depend on various factors such as the exceedance to the background level, its absolute level, time of day and change in environment, as well as local attitudes to the source of sound and character of the neighbourhood.



3 ENVIRONMENTAL SURVEY SUMMARY

3.1 An environmental survey has been undertaken between Thursday 10th to Friday 11th June 2021 to quantify sound levels at the development site in accordance with BS 4142. Details of the study have been provided in Appendix D with results summarised herein this section.

BACKGROUND AND RESIDUAL SOUND LEVELS

3.2 The 'typical' background sound levels have been reported in this section in accordance with BS 4142 as established from histograms of the recorded dB $L_{A90, 15min}$ data at Position 1, shown in Appendix D. The measurement location has been used to describe the underlying climate at the nearest noise sensitive location during proposed operating periods.

3.3 In line with Section 8.1.4 of BS 4142, the monitoring duration should reflect the range of background noise levels for the period assessed. In practice, there is no single level for background sound as this is a fluctuating parameter, although a representative value of the period should be used. Note this is not either the lowest or mean average value of dB $L_{A90, 15min}$.

Measurement Data		Free Field Sound Pressure Level, dB $L_{A90, T}$ re. 20 μ Pa		
Date Range	Time HH:MM	Position 1, boundary of NNSL Starlings		
		Range	Representative	Period Description
10/06/21	07:00 – 19:00	42 – 57	56*	Day
–	19:00 – 23:00	37 – 56	38**	Evening
11/06/21	23:00 – 07:00	32 – 41	35	Night

*Dominated by existing adjacent rooftop plant noted to operate approximately between 09:30 - 19:30 hours from analysis of the time-history chart in Appendix D1.

**Representative of most noise sensitive period of proposed operation 22:00 – 23:00.

Table 2 – Background sound level summary, dB $L_{A90, T}$.

3.4 The residual sound level data in this section have been summarised from raw data in Appendix D, generally in accordance with the requirements of BS 4142. The snapshots of environmental sound are taken to be representative of the underlying noise climate without the development in operation and are used to evaluate the environmental noise impact for the development.

Measurement Data		Free Field Sound Pressure Level, dB $L_{Aeq, T}$ re. 20 μ Pa		
Date Range	Time HH:MM	Position 1, boundary of NNSL Starlings		
		Range dB $L_{Aeq, T}$	Representative* dB $L_{Aeq, T}$	Period Description
10/06/21	07:00 – 19:00	52 – 61	58**	Day
–	19:00 – 23:00	48 – 58	49	Evening
11/06/21	23:00 – 07:00	41 – 52	43	Night

* Representative values of residual have been noted at times of representative background sound.

**Dominated by existing adjacent rooftop plant.

Table 3 – Residual sound level summary, dB $L_{Aeq, T}$.

4 NOISE IMPACT ASSESSMENT

4.1 The impact of activity noise from the proposed development on the surrounding environment will depend on several factors, including (but not limited to) the time of day, frequency of occurrence and nature of sound source. Development activities will naturally pose greater noise risk where they are permissible during noise sensitive periods where the likelihood of annoyance or sleep disturbance increases. Human response to noise depends on sociological factors, attitudes and perceptions which can be difficult to define and account for any individual case.

4.2 The recognised methodology for assessment has been taken from BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* which includes consideration of sound from fixed plant installations. The numerical assessment has been provided below for relevant periods of proposed operation, following the definition of specific sound levels.

4.3 The plant schedule proposed has been detailed in Appendix C and summarised as follows:

- Supply fan Systemair_MUB_T-S_025 internally mounted, ducted to rear lower roof.
- Exhaust fan Helios GBW 400/4 mounted on south elevation and ducted to top roof level.

4.4 The calculation of the specific sound levels has been detailed in Appendix E for BS 4142 assessment. The following assumptions have been made:

- Kitchen extract and supply data has been based on manufacturers published data sheets provided in Appendix C.
- The exhaust and supply fan has been calculated with in-duct silencers; example suitable specifications have been provided in Appendix C based on Acoustica rectangular duct silencers. Flow rates should be verified as suitable by the mechanical engineer.
- All plant has been assessed as continuously operating during the proposed period of operation.

4.5 The specific sound levels (as mitigated) at the noise sensitive locations have been summarised below, from the calculation in Appendix E:

Noise Sensitive Location	Description	Result
NSL 1	Supply inlet level at rear 1F window, dB $L_{Aeq,T}$	28*
NSL 2	Extract exhaust at rear 2F window, dB $L_{Aeq,T}$	27*
NSL 3	Casing break-out radiation at residential flats to the south, dB $L_{Aeq,T}$	28

*As mitigated, see example suitable silencer specifications in Appendix C.

Table 4 – Specific sound levels calculated at nearest noise sensitive locations.

4.6 The following numerical assessments have been provided in accordance with BS 4142 to provide a comparison between the rating sound level of the proposal against the background sound level existing prior to development.



BS 4142 assessment of supply fan noise emissions (mitigated)			
Result	Day 07:00 – 19:00	Evening 19:00 – 23:00	Commentary
Background sound level, dB $L_{A90, T}$	56	38	Estimated as representative from histogram of background sound levels, from Table 2 and Appendix D, during periods of proposed operation.
Residual sound level, dB $L_{Aeq, T}$	58	49	Representative based on the underlying range of measured levels in Table 3, as occurring during times of background sound.
Reference time interval	1-hour	1-hour	Relevant time interval for assessment period from BS 4142.
Predicted sound level	28	28	
On-time correction	0	0	Continuously operating ventilation plant
Specific sound level, dB $L_{Aeq, T}$	28	28	Meets Reading Borough Council specific sound level requirement.
Acoustic feature correction, dB	0	0	No penalty for broadband continuously operating noise.
Rating level, dB $L_{Ar, Tr}$	28	28	The rating level is equal to the specific sound level plus acoustic feature corrections.
Excess of rating level over background sound level	-28	-10	Meets Reading Borough Council requirement.
Assessment indicates likely indication of: *depending on the context	insignificant	low impact*	Where the rating level does not exceed the background sound level during daytime use, this is an indication of the specific sound source having a low impact, depending on the context.
Uncertainty of the assessment	<i>Insignificant</i>		See Statement of Uncertainty.

Table 5 – Numerical assessment in accordance with BS 4142 at nearest noise sensitive location NSR 1.

BS 4142 assessment of extract fan noise emissions (mitigated)			
Result	Day 07:00 – 19:00	Evening 19:00 – 23:00	Commentary
Background sound level, dB $L_{A90, T}$	56	38	Estimated as representative from histogram of background sound levels, from Table 2 and Appendix D, during periods of proposed operation.

Residual sound level, dB $L_{Aeq, T}$	58	49	Representative based on the underlying range of measured levels in Table 3, as occurring during times of background sound.
Reference time interval	1-hour	1-hour	Relevant time interval for assessment period from BS 4142.
Predicted sound level	27	27	
On-time correction	0	0	Continuously operating ventilation plant
Specific sound level, dB $L_{Aeq, T}$	27	27	Meets Reading Borough Council specific sound level requirement.
Acoustic feature correction, dB	0	0	No penalty for broadband continuously operating noise.
Rating level, dB $L_{Ar, Tr}$	27	27	The rating level is equal to the specific sound level plus acoustic feature corrections.
Excess of rating level over background sound level	-29	-11	Meets Reading Borough Council requirement. Where the rating level does not exceed the background sound level during daytime use, this is an indication of the specific sound source having a low impact, depending on the context.
Assessment indicates likely indication of: *depending on the context	insignificant	low impact*	
Uncertainty of the assessment	<i>Insignificant</i>		See Statement of Uncertainty.

Table 6 – Numerical assessment in accordance with BS 4142 at nearest noise sensitive location NSR 2.

BS 4142 assessment of extract case radiation noise emissions (mitigated)			
Result	Day 07:00 – 19:00	Evening 19:00 – 23:00	Commentary
Background sound level, dB $L_{A90, T}$	56	38	Estimated as representative from histogram of background sound levels, from Table 2 and Appendix D, during periods of proposed operation.
Residual sound level, dB $L_{Aeq, T}$	58	49	Representative based on the underlying range of measured levels in Table 3, as occurring during times of background sound.
Reference time interval	1-hour	1-hour	Relevant time interval for assessment period from BS 4142.
Predicted sound level	24	24	Meets Reading Borough Council specific sound level requirement.
On-time correction	0	0	Continuously operating ventilation plant

Specific sound level, dB L _{Aeq,T}	28	28	
Acoustic feature correction, dB	0	0	No penalty for broadband continuously operating noise.
Rating level, dB L _{Ar, Tr}	28	28	The rating level is equal to the specific sound level plus acoustic feature corrections.
Excess of rating level over background sound level	-28	-10	Meets Reading Borough Council requirement. Where the rating level does not exceed the background sound level during daytime use, this is an indication of the specific sound source having a low impact, depending on the context.
Assessment indicates likely indication of: *depending on the context	insignificant	low impact*	
Uncertainty of the assessment	<i>Insignificant</i>		See Statement of Uncertainty.

Table 7 – Numerical assessment in accordance with BS 4142 at nearest noise sensitive location NSR 3.

4.7 The numerical assessments in Tables 5 – 7 has highlighted a negligible impact at the nearest noise sensitive location during periods of proposed operation, where the rating sound level is predicted to lie at least -28 dB or -10 dB below the representative background sound level during the day and evening periods of proposed operation respectively. The requirements of Reading Borough Council are therefore considered to be met based on the proposed scheme of ventilation plant and recommended in-duct silencers.

4.8 The concept of “context” has been notably emphasised in Section 11 of BS 4142 when considering numerical impacts established from applying the standard. Where the numerical assessment shows a significantly low rating level (>10 dB), context may not be deemed important to the assessment. The following contextual comments have been noted however in support of the notion of low or negligible impact from the numerical assessment:

- 4.8.1 The sound climate during the daytime period at the rear first and second floor windows is dominated by existing adjacent mechanical plant. This is evident from site observation and the annotated time-history chart in Appendix D.
- 4.8.2 The residual sound level is significantly higher than the predicted plant rating level, dominated by local road traffic along the Basingstoke Road.
- 4.8.3 The absolute level inside the receptor (residential habitable room) will reduce by typically 13 dB via an open window, the sound source (as mitigated) is expected to be practicably inaudible.



STATEMENT OF UNCERTAINTY

4.9 Uncertainty inevitably limits the accuracy associated with all steps of any noise assessment, including measurement, calculation, or prediction. Factors include, but are not limited to:

- The inherent accuracy limitation of methodology in Standards and guidance.
- Variability in meteorological conditions.
- The accuracy of sound source input data of a calculation.

4.10 It is imperative to minimise the uncertainty to a level commensurate with the intention of the assessment objective. Measures taken in this assessment to minimise uncertainty are:

- Baseline sound levels have been measured over a reasonably long period and therefore provide a good indication of representative background and residual sound levels.
- Sound level measurements were undertaken in accordance with recognised Standards, using a tall environmental windshield and were undertaken during reasonable weather conditions e.g. acceptably low wind speeds and precipitation.
- A direct measurement location was used and is considered to provide a representative basis for background noise levels at the nearest receiver locations to the development.
- Field calibration checks were undertaken before and after measurements to record very low levels of equipment drift.
- The sound source data has been provided from manufacturer's data.
- The calculations have been conservative as not to under-predict the resulting impacts.

4.11 The aforementioned measures have been considered to reduce uncertainty to a level considered not to have any significance to the outcome of this assessment.



5 PREDICTED NOISE IMPACTS AND PLANNING

- 5.1 The evaluated noise impacts in this report should be considered by Reading Borough Council mindful of the National Planning Policy Framework and Noise Policy Statement for England, which currently define the policy and decision-making requirements for planning and noise.
- 5.2 In deciding a suitable planning outcome, it must be recognised that noise management is a complex issue and at times requires complex solutions. There is no European or national noise limit which must be met. To assist in defining what level of noise impacts should be acceptable in sustainable development, the NPSE refers to established concepts from toxicology that are currently being applied to noise impacts.
- 5.3 The NPSE suggests that noise levels above the SOAEL should be avoided and that if noise levels fall between the LOAEL and SOAEL all reasonable steps should be taken to minimise and mitigate adverse effects while also considering the guiding principles of sustainable development. This does not mean that adverse effects cannot occur from a noise-generating development.
- 5.4 The range of noise impacts reviewed for the proposed development have been deemed acceptable with respect to overarching requirements for planning and noise, where resulting impacts have been anticipated around the LOAEL threshold of the NPSE.
- 5.5 **It is expected that the development sound resulting from the proposed kitchen plant will be largely unnoticeable, or, just perceptible outside of the receptor window during the most noise sensitive periods of assessment. In this regard, the development may marginally affect the acoustic character of the area during the most sensitive periods of proposed operation, but not to the extent that there is a perceived change in quality of life. Furthermore, the noise emissions have been predicted to meet the limits stipulated by Reading Borough Council.**
- 5.6 In accordance with overarching planning requirements, measures have been satisfactorily considered to *“mitigate and minimise adverse impacts on health and quality of life”* which can be secured on the development by conditional approval, if necessary, to include:
- Suitably selected in-duct silencers for supply and extract fans, example suitable acoustic performance specifications have been provided in Appendix C.



6 CONCLUSIONS

- 6.1 An assessment of environmental sound levels has been carried out for proposed kitchen extract and supply ventilation plant at 103 Basingstoke Road, Reading RG2 0HA. Environmental sound levels have been taken from a site survey at the nearest receptor windows relative to the proposed plant.
- 6.2 A noise impact assessment has been carried out in line with BS 4142 methodology. Cumulative rating sound levels have been predicted at the nearest residential receptors, based on manufacturers sound data for proposed plant.
- 6.3 The numerical assessment in Section 4 has predicted rating levels (as mitigated) significantly below the representative background sound level (at least 10 dB below) for periods of proposed day and evening operation. The noise emissions have been predicted to meet the limits stipulated by Reading Borough Council.
- 6.4 Example in-duct silencers for the extract and supply fans have been provided in Appendix C as suitably rated acoustic attenuation; air flow considerations should be reviewed by the mechanical engineer.
- 6.5 It has been concluded from the findings of this assessment that noise should not present reasonable grounds for planning refusal. The likely acoustic effects have been established about the LOAEL threshold of the NPSE, such that noise may be heard but does not cause any change in behaviour or attitude. It may slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.
- 6.6 Where it is deemed appropriate to grant approval of the proposed kitchen plant, commensurate noise mitigation can be controlled by condition, if necessary, to include mitigation described in this report (provision of in-duct atmosphere side silencers for the supply and extract fans).



Appendix A: Glossary of Acoustic Terms

'A' weighting dB(A): Correction applied to the frequency range of a noise in order to approximate the response of the human ear. Noise measurements are often A-weighted using an electronic filter in the sound level meter.

Attenuation: Sound reduction, measured in decibels (dB).

Ambient Sound: The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far. Note: The ambient sound comprises the residual sound and the specific sound when present.

Background sound level: A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

Calibration: A check of the function of a sound level meter by comparing the meter reading with a known sound pressure level.

Decibel (dB): The unit of sound level and noise exposure measurement. The range of audible sound pressures is approximately 0 dB to 140 dB.

Frequency (Hz): The pitch of the sound, measured in Hertz.

L_{Aeq,T}: The A-weighted equivalent continuous sound pressure level during a period. It is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period, T.

Octave-bands: A division of the frequency range into recognised bands.

Rating level, L_{Ar,Tr}: The specific sound level plus any adjustment for the character of the sound.

Residual sound: Ambient sound remaining in the absence of the specific sound or that it is suppressed as not to contribute to the ambient sound level.

Residual sound level, L_r or L_{eq,T}: The equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given reference time interval, T.

Sound pressure level (SPL): The basic measure of sound, expressed in decibels, usually measured with an appropriate frequency weighting (e.g. the A-weighted SPL in dB(A)).

Sound power level (L_w): The sound energy radiated per unit time by a sound source measured in watts (W). Sound power can be weighted (e.g. A-weighted) and is not influenced by environmental or physical factors such as weather or distance.

Specific sound: Sound source being assessed.

Specific sound level, L_s or L_{eq,T}: The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval, T.



Appendix B: Annotated Location Plan



Figure B1 – Location Plan, with measurement position annotated.

Appendix C: Scheme Design



Figure C1 – Existing development layout plan.

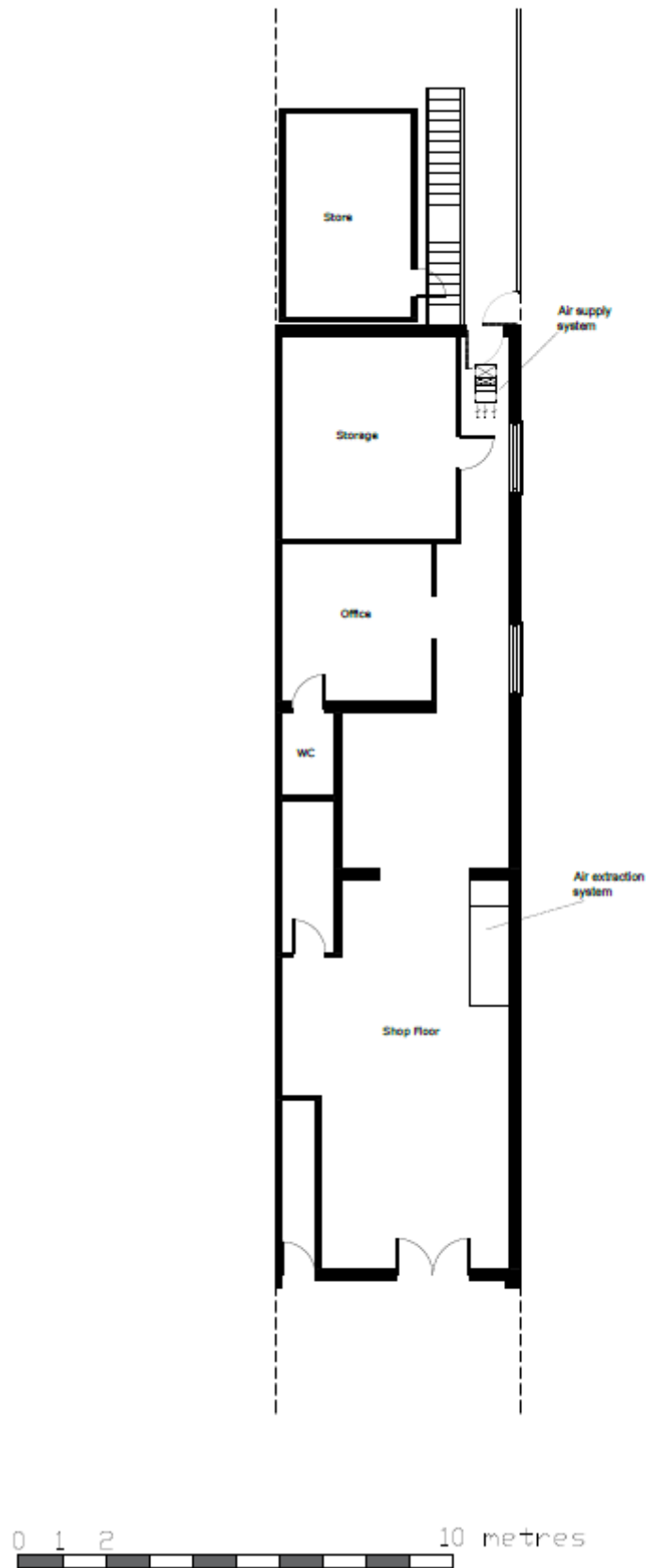


Figure C2 – Proposed development layout plan.

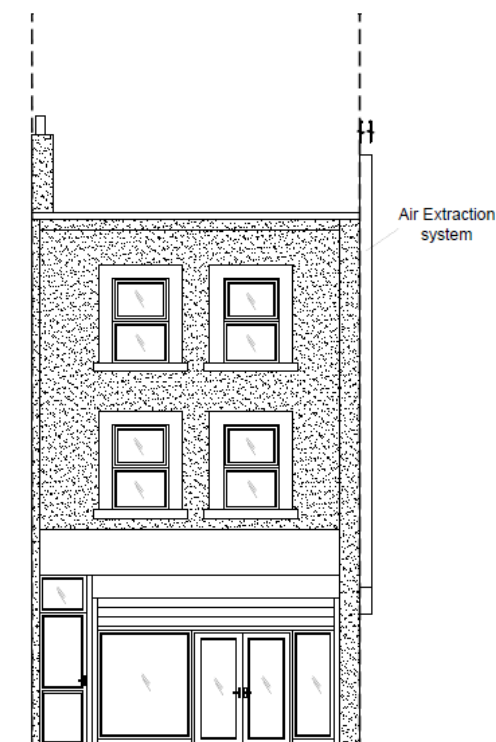


Figure C3 – Proposed front elevation.

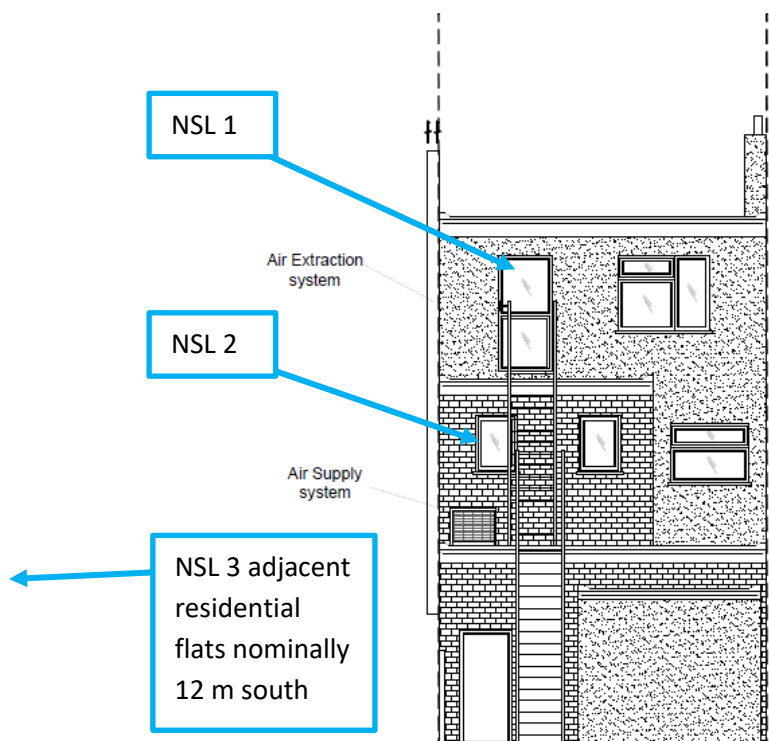


Figure C4 – Proposed rear elevation with noise sensitive locations NSL 1, NSL 2 and NSL 3 annotated.

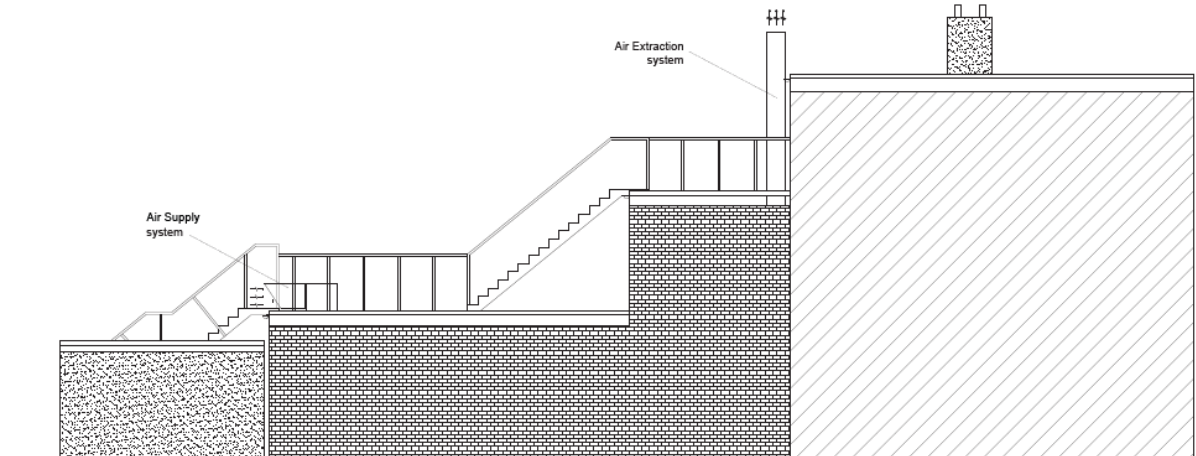


Figure C5 – Proposed north elevation.

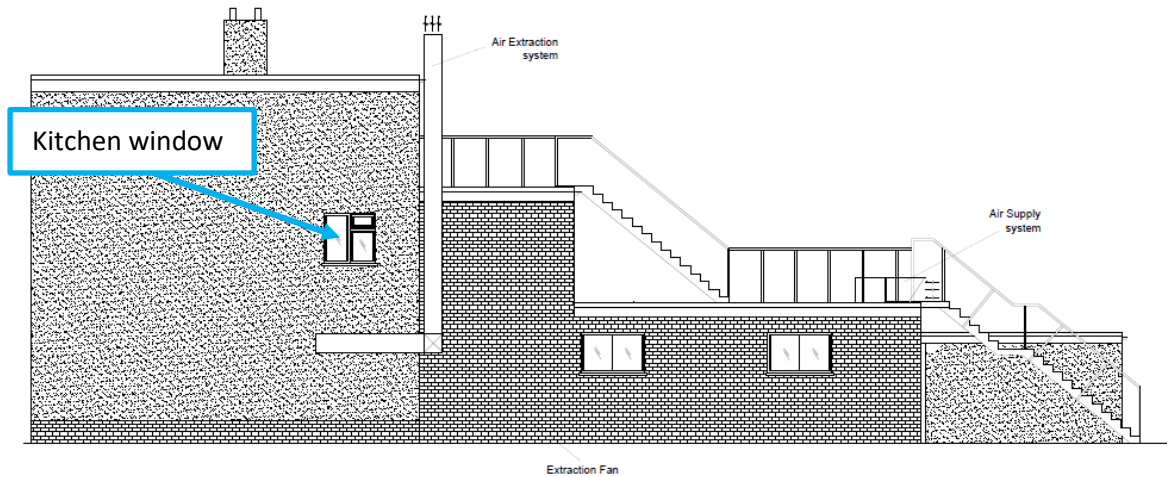
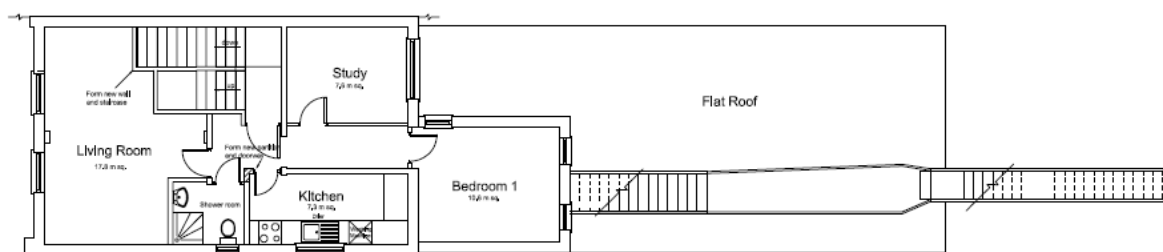


Figure C6 – Proposed south elevation (non-habitable kitchen window annotated).

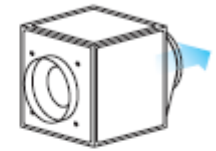


Proposed First Floor Plan

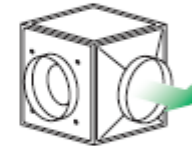
Figure C7 – Plan showing residential first floor layout, indicating kitchen (non-habitable room) on south elevation.

Models GB..

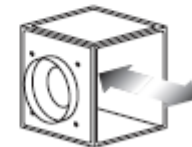
Arbitrary installation position and flexible assembly by five possible discharge directions.



Ⓐ Axial discharge



Ⓑ Centrifugal discharge



— centrifugal on both sides, free discharge

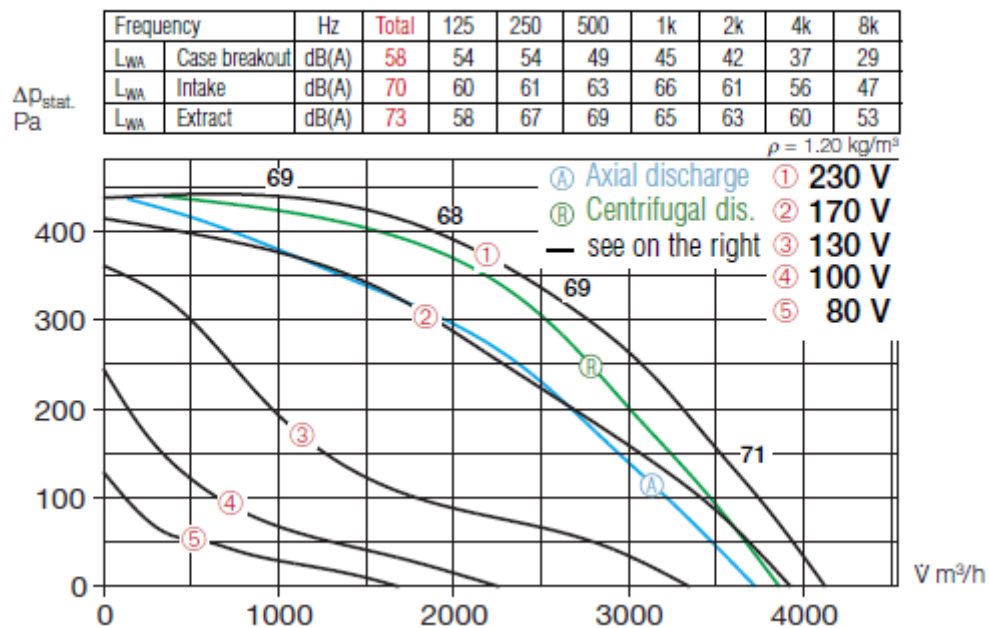
GBW 400/4

Figure C8 – Proposed extract fan data Helios GBW 400/4.



MUB/T-S 025 315D2

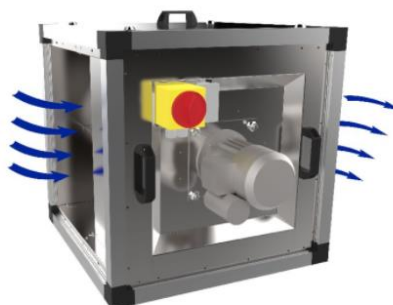
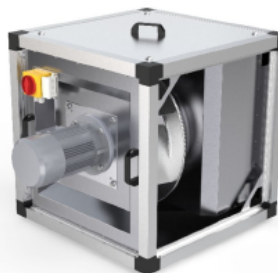
Centrifugal box fan, 120°C continuous, insulated

Item Number: 235445

Variant: 400V 3~ 50Hz

- Inline airflow direction
- Up to 120°C medium temperature, continuous operation
- use, e.g. for kitchen exhaust air
- Pre-mounted isolator is standard
- Low sound level
- High efficient motors
- Easy to maintain and reliable
- Motor outside the air stream

All MUB/T-S fans have new optimized and high efficient HD impellers with backward curved blades, manufactured from aluminium. The fans are equipped with IEC standard motors outside the air stream for all 400V three phase motors from 0.75 kW. Optimum motor protection by cold conductors to be connected to an external motor protection device. The casing consists of an aluminium frame with fibreglass reinforced plastic corners and double skin, galvanised steel panels with a 30 mm mineral wool insulation. With quick lock access door. The MUB/T-S bottom panel is a drain tray and incorporates a pre-mounted 1" drain plug. An additional pre-wired isolator switch is mounted on the casing.



Sound power level		63	125	250	500	1k	2k	4k	8k	Total
Inlet	dB(A)	43	62	79	81	82	79	76	70	87
Outlet	dB(A)	45	64	81	82	83	81	77	71	88
Surrounding	dB(A)	22	43	54	50	52	53	43	34	59
Sound pressure level at 3m (20m ² Sabine)	dB(A)	-	-	-	-	-	-	-	-	52
Sound pressure level at 3m free field	dB(A)	-	-	-	-	-	-	-	-	38

Figure C9 – Proposed supply fan data Systemair_MUB_T-S_025_315D2.

R02 4**R02 4 RECTANGULAR SILENCER**

Available in eight standard lengths R02 4 Rectangular Duct Mounted Silencers have excellent attenuation properties, achieved with sound absorbing infill splitters, retained in the attenuator casing by a perforated liner.

The resistance to airflow is a function of the face velocity and length. It is not recommended to select the R02 4 silencers with a face velocity above 4.5 metres per second without asking advice regarding re-generated self noise. We can advise on the selections and can perform system analysis to ensure the correct unit is specified.

INSERTION LOSS (db) - CENTRE BAND FREQUENCY

PRODUCT CODE	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
R02 4-600	5	8	12	23	30	30	23	18
R02 4-900	6	10	16	30	37	37	30	24
R02 4-1200	7	13	22	38	47	47	40	29
R02 4-1500	8	16	26	42	49	49	45	32
R02 4-1800	9	18	31	46	50	49	47	34
R02 4-2100	11	20	36	50	50	50	50	41
R02 4-2400	12	22	40	50	50	50	50	47

Insertion loss data is derived from continual testing to BS4718 and other standards in independent UKAS certified laboratories, which includes where appropriate re-generated or self noise testing in both forward and reverse flow conditions. If you request system analysis from our technicians all predictions will be assessed using the relevant certified insertion loss data together with relevant dynamic corrections.

- High performance rectangular duct silencer
- Eight standard lengths
- Many connection options
- Cross section dimensions in 1mm increments
- System pressure within ducted systems to 1500 Pa
- Special lengths on request

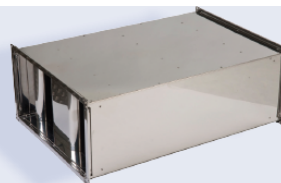
RESISTANCE TO AIRFLOW (Pa)

FACE VELOCITY M/S	1.5	2.0	2.5	3.0	3.5
R02 4-600	15	23	33	43	60
R02 4-900	15	23	34	44	61
R02 4-1200	16	24	35	46	63
R02 4-1500	16	25	35	48	67
R02 4-1800	17	25	35	50	68
R02 4-2100	18	26	36	51	68
R02 4-2400	18	26	38	52	69

The suffix indicates the length 600 = 600mm longitudinally

Figure C10 – Example suitable silencer specification for supply fan (atmosphere side),

R02 4-600. (Flow rates should be verified by the mechanical engineer).

R02 5**R02 5 RECTANGULAR SILENCER**

Available in eight standard lengths R02 5 Rectangular Duct Mounted Silencers have excellent attenuation properties, achieved with sound absorbing infill splitters, retained in the attenuator casing by a perforated liner.

The resistance to airflow is a function of the face velocity and length. It is not recommended to select the R02 5 silencers with a face velocity above 5 metres per second without asking advice regarding re-generated self noise. We can advise on the selections and can perform system analysis to ensure the correct unit is specified.

INSERTION LOSS (db) - CENTRE BAND FREQUENCY

PRODUCT CODE	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
R02 5-600	4	6	11	19	24	23	18	12
R02 5-900	4	6	12	26	30	31	22	16
R02 5-1200	5	9	18	32	40	39	28	19
R02 5-1500	7	11	23	37	45	45	32	22
R02 5-1800	8	13	25	44	50	50	37	24
R02 5-2100	9	16	28	50	50	50	45	29
R02 5-2400	11	19	33	50	50	50	50	32

Insertion loss data is derived from continual testing to BS4718 and other standards in independent UKAS certified laboratories, which includes where appropriate re-generated or self noise testing in both forward and reverse flow conditions. If you request system analysis from our technicians all predictions will be assessed using the relevant certified insertion loss data together with relevant dynamic corrections.

- High performance rectangular duct silencer
- Eight standard lengths
- Many connection options
- Cross section dimensions in 1mm increments
- System pressure within ducted systems to 1500 Pa
- Special lengths on request

RESISTANCE TO AIRFLOW (Pa)

FACE VELOCITY M/S	1.5	2.0	2.5	3.0	3.5
R02 5-600	10	16	22	39	60
R02 5-900	10	16	23	40	62
R02 5-1200	11	16	24	40	64
R02 5-1500	11	17	25	40	66
R02 5-1800	11	18	26	42	67
R02 5-2100	12	19	26	43	69
R02 5-2400	13	19	28	48	71

The suffix indicates the length 600 = 600mm longitudinally

Figure C11 – Example suitable silencer for extract fan (atmosphere and room side),

R02 5-600. (Flow rates should be verified by the mechanical engineer).

Appendix D: Environmental Survey Summary

The equipment used conforms to BS EN 61672-1:2003 (Class 1) for sound level meters and BS EN 60942 (Class 1) for sound calibrators; with at least traceable calibration history valid; no greater than two years for sound level meters and one year for sound calibrators, relevant to the times of the site assessment.

Position No.	Manufacturer	Model No.	Description	Serial No.
P1	Larson Davis	LxT (SE)	3 rd octave band sound level meter	4203
	Larson Davis	PRMLxT1L	Microphone preamplifier (low range)	35997
	Larson Davis	337B02	½" electret microphone	154590
	Larson Davis	CAL200	Sound level calibrator	13691

Table D1 – Sound monitoring equipment.

Validation checks at the end of the survey demonstrated acceptable drift across all parts of the study, across the sound level measurement equipment used, of ≤ 0.20 dB. Interval data was recorded at the measurement location at 1-minute and 15-minute periods, time synchronised to BST.

Weather conditions at the times of site attendance were deemed acceptable for surveying.

Weather conditions	Start	Finish	Additional comments
Wind velocity	< 3 m/s Average < 3 m/s Gust	< 3 m/s Average < 3 m/s Gust	None
Wind direction	Negligible to assessment	Negligible to assessment	
Cloud cover/rain	overcast, dry	overcast, dry	
Temperature	23 °C	22 °C	

Table D2 – Recorded weather conditions.

A brief description of the measurement position has been provided below:

Position 1) Located at first floor level on the flat roof to the rear of the building, in a façade position 1 m from the rear façade / residential windows closest to the proposed plant location. This position is used as representative of the noise climate at the nearest noise sensitive location.

Incident sound was observed predominantly from existing adjacent commercial building services plant (when operating during the daytime period); noise emissions from road traffic along the Basingstoke Road was notable.





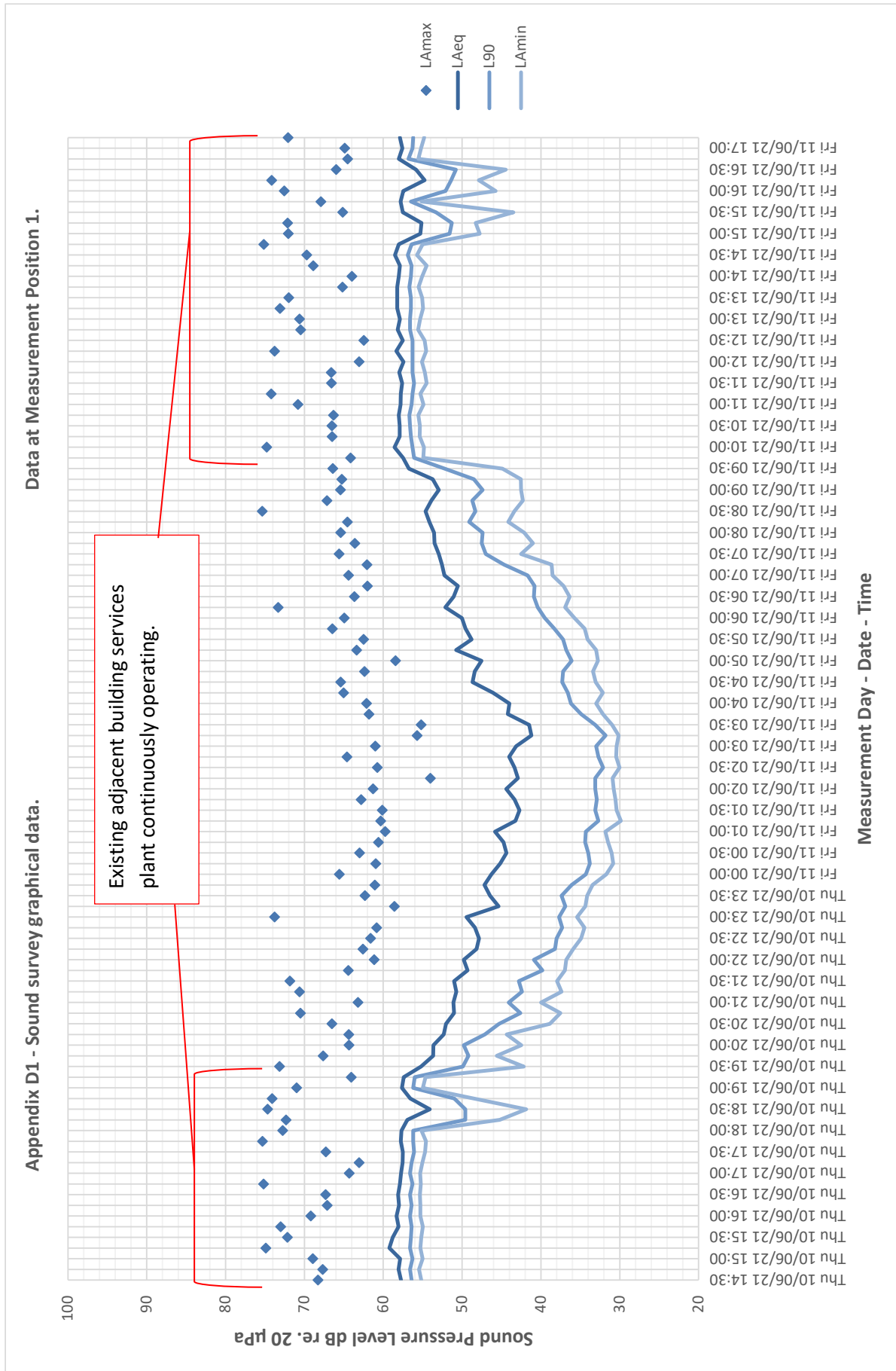
Figure D1 – Photo highlighting Measurement Position 1, showing de-commissioned condenser plant servicing the previous ground floor commercial use in immediate vicinity of the residential window.

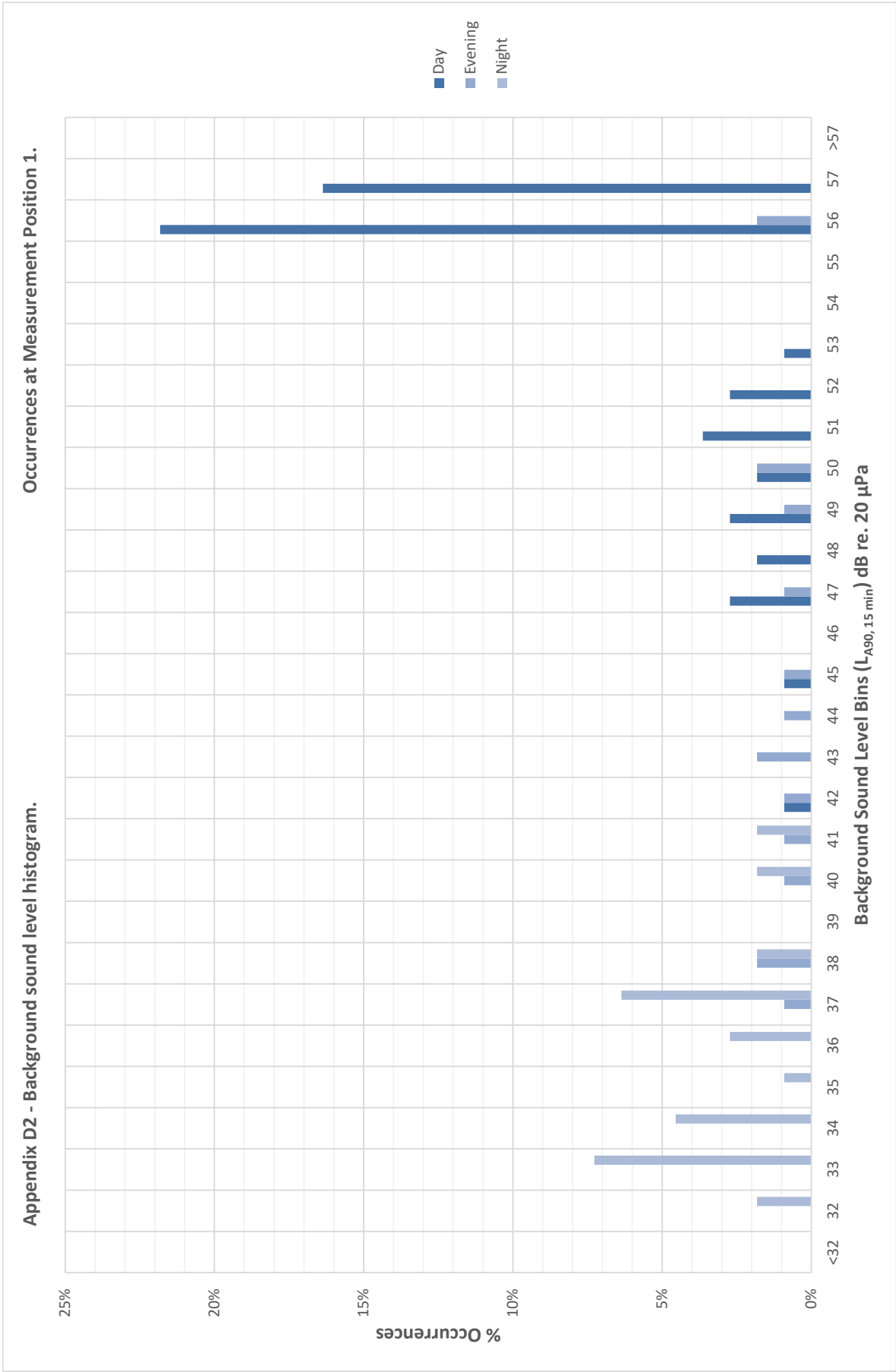


Figure D2 – Photo highlighting adjacent commercial rooftop plant (clearly audible in operation at position 1).



Figure D3 – Photo highlighting adjacent commercial rooftop plant, adjacent rear elevation.





Appendix E: Calculations

Systemair_MUB_T-S_025_315D2 w(atmos. supply)											
#	Procedure	Data	Octave band level dB								Total
			63	125	250	500	1000	2000	4000	8000	dBA
1	Systemair_MUB_T-S_025_315D2 Sound Power data (Inlet)	LwA, dB	43	62	79	81	82	79	76	70	87
2	Silencer, R02 4-600	IL, dB	-5	-8	-12	-23	-30	-30	-23	-18	
3	Duct loss (nominal 7.5 m)	dB	-15.0	-10.5	-4.5	-3.0	-3.0	-3.0	-3.0	-3.0	
4	Bend losses (unlined rectangular, x2)	dB	0	-2	-10	-16	-8	-6	-6	-6	
5	End reflection in free space	dB	-16	-11	-7	-5	-1	0	0	0	
6	Sound power level at exit	LwA, dB	7	31	46	34	40	40	44	43	50
7	Reflections (Q=2)	dB	3	3	3	3	3	3	3	3	
8	Power to pressure over 2 m	LpA, dB	-17	-17	-17	-17	-17	-17	-17	-17	
9	Screening attenuation	dB	0	0	-2	-8	-12	-13	-20	-22	
10	Directivity correction (nominal opening 0.5 m; 120°)	dB	0	0	-2	-8	-12	-13	-20	-22	
11	A-weighted sound pressure level at receptor	dB LpA	-7	16	27	4	2	0	-10	-15	28

Table E1 – Calculation of specific sound level at NSR 1; kitchen supply inlet including silencer.

GB 400-4 (atmos. exhaust)											
#	Procedure	Data	Octave band level dB								Total
			63	125	250	500	1000	2000	4000	8000	dBA
1	GB 400-4 Sound Power data (outlet)	LwA, dB		58	67	69	65	63	60	53	73
2	Silencer R02-5 600	IL, dB		-6	-11	-19	-24	-23	-18	-12	
3	Duct loss (7.5m length)	dB		-10.5	-4.5	-3.0	-3.0	-3.0	-3.0	-3.0	
4	Bend losses (0 bends)	dB		0	0	0	0	0	0	0	
5	End reflection	dB		-5.1	-2.1	-0.7	-0.2	-0.1	0.0	0.0	
6	Sound power level at exit	LwA, dB		36	49	46	38	37	39	38	52
7	Reflections (Q=2)	dB		3	3	3	3	3	3	3	
8	Power to pressure over 3 m	LpA, dB		-21	-21	-21	-21	-21	-21	-21	
9	Screening attenuation	dB		0	0	0	0	0	0	0	
10	Directivity correction (nominal opening 0.4 m; 120°)	dB		-2	-6	-15	-15	-30	-30	-30	
12	A-weighted sound pressure level at receptor	dB LpA		17	26	14	5	-11	-9	-10	27

Table E2 – Calculation of specific sound level at NSR 2; kitchen extract including silencer.

Procedure	125	250	500	1000	2000	4000	8000	dBA
Case break-out, GBW 400/4, dB LwA	54	54	49	45	42	37	29	58
Reflections (Q=2)	3	3	3	3	3	3	3	3
Power to pressure over 12 m, dB LpA	-33	-33	-33	-33	-33	-33	-33	-33
A-weighted sound pressure level at receptor, dB LpA	24	24	19	15	12	7	-1	28
Resultant level at receptor, dB LAeq,T								28

Table E3 – Calculation of specific sound level at NSR 3; wall mounted kitchen extract fan case break-out.



Appendix F: Acousticians Qualifications and Status

James Blakeley BSc. (Hons) MIOA

Position Held: Senior Acoustic Consultant.

Qualifications: BSc. (Hons) Audio Technology.

Affiliations: Member of the Institute of Acoustics.

Acoustics Experience: 9 years.

Lee Denson BSc. (Hons) MSc. MIOA

Position Held: Principal Acoustic Consultant.

Qualifications: BSc. (Hons) Music Technology.
MSc. Music Technology.

Affiliations: Member of the Institute of Acoustics.

Acoustics Experience: 8 years.

Core Competences: Building Acoustics, Noise & Vibration from Building Services.

