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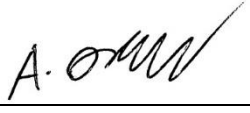
Project:

2-4 Church Road, Caversham

Title:

External Noise Ingress Assessment



Report Title	2-4 Church Road, Caversham External Noise Ingress Assessment		
Reference	AO/EC20158-7		
Version	2		
Issue Date	16 th April 2023		
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Revision	Date	Author	Checked
0	06/12/2023	Alex Oakes	Jon Mudd
1	15/04/2024	Alex Oakes	Jon Mudd

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1 INTRODUCTION

- 1.01 Environmental Equipment Corporation Limited has been commissioned by Farrell & Clark LLP. to undertake an assessment to demonstrate that new residential dwellings to be formed at 2- 4 Church Road will provide an acceptable internal acoustic environment, fit for habitation.
- 1.02 This noise assessment has been conducted in accordance with the national planning policies and requirements of Reading Borough Council and is based on a noise survey carried out at the site over a typical weekday period.
- 1.03 This assessment includes:
- A summary of the existing external noise levels impinging upon the front and rear façade of the building; and
 - Guidance on minimum façade sound insulation performance specifications to achieve the ideal design targets of BS8233:2014, including outline guidance on suitable glazing specifications.
- 1.04 This report is prepared solely for Farrell & Clark LLP.. Environmental Equipment Corporation Limited accepts no responsibility for its use by any third party. Note that the contents contained herein are produced for the purposes of review by relevant Planning Authority departments and do not constitute a detailed design or specification document to be used for the purposes of construction. Subsequent development of noise mitigation schemes shall engage EEC Ltd and Farrell & Clark LLP. so as to support the conclusions of this report.
- 1.05 Whilst every effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in Appendix A.

2 SITE

- 2.01 2 – 4 Church Road is a former bank building over two storeys. This application includes proposals for ground floor commercial retail space, the conversion of the first floor office space to two, adjoining residential flats and the construction of a new second floor extension to form an additional flat.
- 2.02 The aerial photograph taken from Google Maps has been annotated to show the current site and the immediate surroundings. The site is set in a mixed residential and commercial area of Caversham. The front of the site overlooks the junction of Church Road and Church Street. The adjoining neighbouring building is currently a Thai restaurant with the Griffin public house beyond this. At the rear of the site is car parking and outdoor area for the Griffin Public House and other commercial properties along the A4155. We have also annotated the measurement locations used for the survey.



Figure 1 – Existing site layout and immediate surroundings

- 2.03 Noise levels at the front of the site were observed to be controlled primarily by local and distant road traffic with also some noise from mechanical plant associated with the nearby restaurant and public house.
- 2.04 Noise levels at the rear of the site were influenced by local and distant road traffic, however, were controlled primarily from noise generated by third party plant serving the neighbouring restaurant premises. Through interrogation of the measured noise data and an inspection on site, an extract fan terminal rising above the existing roof-level of 2-4 Church Road was observed to be the controlling source of noise when in operation.
- 2.05 Through the summer months it is likely that the outdoor arear of the Griffin Public House will be in use and will generate patron noise which will impinge on the proposed rooflights of the second floor extensions, and also the noise sensitive windows of the proposed flat in the existing second storey building to the east. From further interrogation of the measured noise data, no patron noise was identified however, a prediction and assessment has been carried out to present the possible impact.
- 2.06 Drawings showing the existing and proposed new layouts are provided in Appendix B of this report.

3 GUIDANCE

National Planning Policy

- 3.01 The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) on 27th March 2012 (as amended on 19th June 2019) and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance 24 Planning and Noise, which previously presented the government's overarching planning policy on noise.
- 3.02 Paragraph 170 in Section 15 of the NPPF (2019), entitled Conserving and enhancing the natural environment, states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

 - e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability..."*
- 3.03 Paragraph 180 in Section 15 also states that:

"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:

 - a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and 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..."*

- 3.04 The Department for Environment Food and Rural Affairs published the Noise Policy Statement for England (NPSE) in March 2010. The explanatory note of NPSE defines the following terms used in the NPPF:

“NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

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

2.21 *Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.*

SOAEL – Significant Observed Adverse Effect Level

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

- 3.05 The NPSE does not define any of the above effect levels numerically.

- 3.06 The NPSE presents the Noise Policy Aims as:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy and sustainable development:

avoid significant adverse impacts on health and quality of life;

mitigate and minimise adverse impacts on health and quality of life; and

where possible, contribute to the improvement of health and quality of life.”

- 3.07 It can be seen that the first two bullet points are similar to Section 11 of the NPPF, with a third aim that seeks to improve health and quality of life. The NPSE later expands on the Noise Policy Aims, stating:

2.23 *The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).*

2.24 *The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.*

2.25 *This aim (the third aim), seeks where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”*

- 3.08 It is clear that noise described in the NPSE as SOAEL that would lead to significant adverse effects should be avoided, although there is no definition as to what constitutes a significant adverse effect. Similarly, noise should be mitigated where it is high enough to lead to adverse effects, termed the LOAEL, but not so high that it leads to significant adverse effects.

ProPG: Planning and Noise – New Residential Development - May 2017

- 3.09 The Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.
- 3.10 The scope of the ProPG is limited to the consideration of new residential development that will be exposed predominantly to airborne noise from transport sources.
- 3.11 The ProPG aims to complement Government planning and noise policy and guidance, and in particular it strives to:
- *‘advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;*
 - *Encourage the process of good acoustic design in and around new residential developments;*
 - *Outline what should be taken into account in deciding planning applications for new noise sensitive developments;*
 - *Improve understanding of how to determine the extent of potential noise impact and effect; and*
 - *Assist the delivery of sustainable development.’*

- 3.12 The ProPG states that:

‘In most circumstance in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not nominally exceed 45 dB $L_{Amax,F}$ more than 10 times a night’

- 3.13 The guidance discusses in detail how the 45dB $L_{Amax,F}$ value was derived and provides a rationale for adopting the 10th highest $L_{AFmax,5 min}$ maximum event during the night-time period as ‘typical’ level.

BS 8233:2014 Guidance on sound insulation and noise reduction for buildings & WHO Guidelines for Community Noise

- 3.14 Section 7 of BS8233:2014, ‘Guidance on sound insulation and noise reduction for buildings’, gives guidance on acoustic criteria and noise levels appropriate for various internal spaces that have different functions. Section 7.7 relates specifically to buildings having a residential purpose and offers guidance on appropriate internal ambient noise levels for dwellings (when unoccupied) with specific consideration:
- i. for bedrooms, the acoustic effect on sleep; and
 - ii. for other rooms, the acoustic effect on resting, listening and communicating.

- 3.15 The guidance applies to external noise as it affects the internal acoustic environment from sources without a specific character.
- 3.16 Table 4 of section 7.7.2 recommends the following internal noise limits based on the presence of steady, external noise sources:

Table 4 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

- 3.17 The guidance criteria are based upon research and existing guidelines provided by the World Health Organisation and is also recommended by Reading Borough Council as being a minimum requirement for new dwellings.
- 3.18 It is generally considered that the sound insulation provided by a partially open window will be 10-15dB, dependent on window type, extent of opening and source frequency content. Adopting a minimum reduction of 10dB in this context will ensure that most assessments are as robust as possible.
- 3.19 It can be seen that in the worst case, with a partially open window reduction of 10dB, indoor ambient noise targets for bedrooms will be met where the external ambient noise level is below 40dB(A). This is based upon steady noise of an anonymous nature and is consistent with the World Health Organisations LOAEL.

World Health Organisation 'Guidelines for Community Noise 1999'

- 3.20 In addition to the advice detailed above within BS8233 the WHO Guidelines for community noise, 1999 also provide the following guidance relating to noise during the night time.

'For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10 -15 times per night'

- 3.21 The guidelines refer to community noise which is also called environmental noise, residential noise or domestic noise, WHO states that this noise encompasses all sources except noise at the industrial workplace. Main sources of community noise include road, rail and air traffic, industries construction and public work and the neighbourhood. The main indoor sources of noise are ventilation systems, office machines, home appliances and neighbours. Typical neighbourhood noise comes from premises and installations related to the catering trade (restaurant, cafeterias, discotheques, etc.), from live or recorded music, sports events including motor sports, playgrounds, car parks and domestic animals such as barking dogs.

ANC Residential Design Guide to Acoustics, Ventilation and Overheating

- 3.22 The ANC Guide to acoustics, ventilation and overheating provides an integrated approach to achieving good acoustic design with the ventilation requirements of Approved Document F (ADF) of the Building Regulations and consideration of the desire to control overheating within dwellings. The good practice document recognises the interdependence of ventilation and overheating when assessing noise and provides a methodology for assessing the noise implications based on various ventilation methodologies that can be utilised.
- 3.23 The guidance provides the following four template systems which can be adopted to demonstrate compliance with the Building Regulations, which are outlined in the table 3.1 below.

Ventilation System	Provision with ADF System/purpose		
	Whole dwelling Ventilation	Extract Ventilation	Purge Ventilation
System 1 Trickle vents & intermittent extract fans	Trickle vents	Intermittent extract fans	Typically provided by opening windows
System 2 Passive Stack	Trickle vents and passive stack ventilation	Continuous via passive stack	Typically provided by opening windows
System 3 Continuous. mechanical extract	Continuous mechanical extract – min. low rate Trickle vents for inlet air	Continuous mechanical extract – min high rate Trickle vents for inlet air	Typically provided by opening windows
System 4 Continuous. mechanical supply & extract with heat recovery (MEV)	Continuous mechanical supply and extract – min. low rate	Continuous mechanical supply and extract – min. high rate	Typically provided by opening windows

Table 3.1: ADF ‘template’ ventilation systems that can be adopted for new dwellings

4 MEASUREMENTS

- 4.01 Environmental noise measurements were carried out at the site over a weekday period to capture the typical existing ambient noise levels impinging upon the front and rear building facades.
- 4.02 Measurements at the site were undertaken between 12:00 hours on Thursday 21st September 2023 and concluded 1700 hours the following day, locations of the two measurement positions are shown in Appendix B and described as:
- Position MP1: located at a height of approximately 1.5m above roof-level of the first floor flat-roof at the rear of the building.
 - Position MP2: Suspended out of a first-floor window of the front elevation of the building, at a height of approximately 6m.
- 4.03 These monitoring positions are considered representative of the existing noise levels impinging upon the elevations of No 2 -4 Church Road, Caversham.

5 EQUIPMENT

5.01 The equipment used for the survey at MP1 was as follows:-

- 01dB Metravib Black Solo Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994;
- 01dB Metravib MCE 212 Condenser Microphone, PRE 21 S Pre-amp and Connecting Leads;
- 01dB Outdoor Microphone Kit and a
- Tripod.

5.02 The equipment holds current UKAS or equivalent accreditation and serial numbers as follows:

Sound Level Meter 01dB Black Solo	Serial No.	65736
	Calibration Date	26 th October 2023
	Cal Certificate No.	U45751
½" MCE 212 Condenser Mic.	Serial No.	175307
	Calibration Date	26 th October 2023
	Cal Certificate No.	45750
Calibrator CAL 21	Serial No.	34634297
	Calibration Date	2 nd May 2023
	Cal. Certificate No.	U44154

N.B. Copies of calibration certificates are available upon request.

5.03 The equipment used for the survey at MP2 was as follows:-

- 01dB Fusion Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994;
- GRAS 40CD Condenser Microphone, PRE22 S Pre-amp and Connecting Leads;
- Tripod.

5.04 The equipment holds current accreditation and serial numbers as follows:

Sound Level Meter 01dB Fusion	Serial No.	14014
	Calibration Date	2 nd May 2023
	Cal Certificate No.	U44157
½" Condenser Mic. GRAS 40CD	Serial No.	383172
	Calibration Date	2 nd May 2023
	Cal Certificate No.	44156
Calibrator CAL 31	Serial No.	94723
	Calibration Date	2 nd May 2023
	Cal. Certificate No.	U44155

N.B. Copies of calibration certificates are available upon request.

5.05 The equipment was calibrated both before and after the survey with no difference noted in the levels.

6 RESULTS

- 6.01 The weather during both survey periods was suitable for noise measurement, it being mostly dry with little wind for the duration.
- 6.02 Noise sources at the front elevation of the site were largely influenced by traffic and pedestrian noise due to the site being parallel to a busy junction of two main roads, the A4155 and A4074.
- 6.03 Noise sources at the rear elevation of the site were also influenced by local and distant road traffic however, were mainly controlled by existing third-party mechanical services and kitchen plant serving the adjoined restaurant premises of Thai Table and Griffin Public house to the south-west of the building.
- 6.04 A list of the levels measured is included in Appendix C and represented graphically in Appendix D.
- 6.05 A summary of the time averaged ambient levels and representative night-time L_{AFmax} levels over the measurement periods are shown in Table 8.1.

Position	Period	Average $L_{Aeq,15m}$ – dB	Representative L_{AFmax} – dB
MP2 – Front	Day time (0700-2300 hrs)	70	-
	Night-time (2300-0700 hrs)	63	83
MP1 – Rear	Day time (0700-2300 hrs)	63	-
	Night-time (2300-0700 hrs)	56	71

Table 8.1: Free-Field Measured Ambient and Lowest Background Noise Levels

7 ASSESSMENT OF EXTERNAL NOISE INGRESS

- 7.01 2 – 4 Church Road, Caversham is undergoing redevelopment works, in which the existing first floor of the building will be converted into two similar apartment dwellings, with the construction of a second floor to feature a further single apartment dwelling. An assessment of noise ingress and minimum façade sound insulation performance requirements is given below for the new dwellings.
- 7.02 It is recommended that the external building fabric of the dwelling is specified to ensure, as a minimum, that the existing external noise is reduced to satisfy the requirements of BS8233:2014, i.e. living room criterion during the daytime of 35dB $L_{Aeq, 16hour}$ and bedroom criterion during the night-time of 30dB $L_{Aeq, 8hour}$, which represents the worst-case scenario. The WHO sleep disturbance criterion of 45dB L_{AFmax} inside is also considered.
- 7.03 The site survey established that sound pressure levels impinging on the relevant facades were typically influenced by:
- Front facade – Road traffic and pedestrian noise during the day and evening;
 - Rear facade – Third-party mechanical services plant, general ambient and traffic noise during the day and evening.

- 7.04 It is proposed that the sound reduction performance required of the external building fabric for the elevations is calculated based on the typical/representative noise levels measured at the front and rear of the site and the ideal limits given in paragraph 7.02 to ensure that the noise ingress from existing noise sources meets appropriate standards and limits the risk of disturbance. The results of the calculations are shown in Table 7.1, where the controlling sound insulation requirement has been highlighted in **bold**.
- 7.05 The sound reduction performance requirements set out below apply to the overall building fabric. However, since the windows are typically the limiting factor in the external building fabric in terms of acoustic performance, the values below will apply to glazing particularly.

Position	Period	Measured External Noise Level, dB	Internal Noise Level Requirement, dB	Sound Reduction Performance Required, dB $R_w + C_{tr}$
Front of Property	07:00-23:00hrs	70 L_{Aeq}	35 L_{Aeq}	35
	23:00-07:00hrs	63 L_{Aeq}	30 L_{Aeq}	33
		83 L_{AFmax}	45 L_{AFmax}	38
Rear of Property	07:00-23:00hrs	63 L_{Aeq}	35 L_{Aeq}	28
	23:00-07:00hrs	56 L_{Aeq}	30 L_{Aeq}	26
		71 L_{AFmax}	45 L_{AFmax}	26

Table 7.1: Required Sound Insulation Performance for BS8233:2014 Compliance.

- 7.06 In order to achieve the time-averaged (16-hour daytime, 8-hour night-time) internal ambient noise levels and target L_{AFmax} levels outlined in BS8233:2014, the building fabric at 2 – 4 Church Road should be designed to achieve no less than 38 dB $R_w + C_{tr}$ at the front facades and 28 dB $R_w + C_{tr}$ at the rear facades.
- 7.07 This would typically be achievable using standard thermal double glazing incorporating an acoustic laminate where necessary and would be considered to achieve the minimum requirements for acoustic comfort in accordance with the relevant design standards.
- 7.08 Table 7.2 below presents an example of glazing recommendations for the site that could be incorporated into the facade design to provide the maximum/worst-case sound insulation values from Table 9.1, and so achieve the most stringent internal noise requirements. Note, these values apply to the overall glazing construction (glass, frames, seals etc); the glazing manufacturer should be able to supply laboratory test data for their full glazing systems upon request.

- 7.09 The surrounding façade construction will be a masonry construction which should offer a minimum of 10dB greater performance at all frequencies to ensure the internal noise levels are maintained.

Location	Example Glazing configuration	Octave Band Sound Insulation Performance, dB							
		125	250	500	1000	2000	4000	R _w	R _w +C _{tr}
Glazed elements Front Facades	6mm / 6mm - 16mm / 6mm Laminated	20	19	30	39	37	46	33	38
Glazed elements Rear Facades	8mm / 6mm - 16mm / 6mm	22	21	28	38	40	47	33	29

**Table 7.2: Minimum Glazing performance specification (R_w+ C_{tr})
(configurations based upon Pilkington sample data).**

- 7.10 Should the final proposal include any trickle ventilation.
- 7.11 It should be noted that the sound insulation values given in Table 7.1 & 7.2 are only relevant for habitable rooms. For non-habitable spaces, for example bathrooms, common stairwells and corridors, the sound insulation requirements could be reduced if this is felt to be beneficial. Using glazing offering the minimal thermal insulation should ensure levels typically accepted for these more transient spaces would be achieved.
- 7.12 With this being said, the proposed second floor extension will introduce two new rooflights which will be within two metres of the identified kitchen extract terminal serving the neighbouring restaurant premises. These rooflights will be serving common areas and stairwells which will not be noise sensitive. Noise levels outside these windows have been calculated at 72 dB(A), please note that the extract fan terminal in question will be required to be relocated to allow for the extension and as such, the above noise level is expected to be less in practice than as calculated as the terminal will be further from the windows than as currently installed and will be subject to further screening reductions.
- 7.13 The proposed rooflights are not required as part of ventilation and are for light ingress only, remaining closed for landlord use and cleaning. With this being said it would be fair to assume a 20 dB reduction for a closed window under day-to-day operation which would produce resultant internal noise levels in the stairwell of around 45 – 50 dB(A).
- 7.14 The closest noise sensitive windows to the kitchen extract fan would be a further 10m minimum distance from the terminal and as such, would be compliant with the internal noise limits so long as the respective glazing meets the above minimum performance requirements.
- 7.15 With regard to the patron noise impact of the outdoor spaces on the noise sensitive windows of the proposed second floor residential dwelling to the east, it is not known how many patrons the outdoor seating area can hold however, 30 patrons have been assumed as a worst case. Following guidance given in IEMA (Section 3), and the existing ambient noise levels measured on site, an

assessment of the impact over a typical weekday period has been undertaken below at the proposed windows of 2 – 4 Church Road, approximately 20 metres away.

7.16 The calculation of noise emissions has been completed on the following basis:

- A maximum capacity of 30 patrons. It is unreasonable to assume that all patrons will be speaking at once, therefore a worst-case of 15 simultaneous speakers have been modelled on the basis of one person in each pair speaking at any given time. In practice, simultaneous speakers and occupancy are expected to be lower than this, and as such noise emission will be reduced.
- Each speaker has been modelled as an acoustic point source, with a Sound Pressure Level of 57 dBA @ 1m (free-field) (as outlined within ISO 3382-3:2012).
- Propagated noise emissions have been calculated in accordance with the principles of ISO 9613.
- Due to the relatively low proposed capacity, enclosed nature of the proposed seating area, and relatively low ambient noise levels, it is not expected that patrons will need to raise their voices in order to have comfortable conversations. Therefore, no allowance has currently been included for the Lombard effect of increased vocal effort.

7.17 Tables 7.1 below presents a summary calculation of the noise emissions when assessed to the windows of 2 – 4 Church Road.

Item	Noise Level	Notes
Single Patron/Speaker	65 dBA	Sound Pressure Level at 1m
Correction for 15 No. Simultaneous Speakers	+ 12 dB	Max capacity, one speaker in each pair of patrons
Cumulative Noise Emissions at Source	77 dBA	Total Sound Pressure Level at source
Spherical Area Losses over 20 metres	- 26 dB	Average distance to closest windows
Barrier Effect	- 10 dB	Screening from building fabric
Local Reflections	+ 3 dB	Semi-enclosed nature of proposed seating area
Immission Level at Receiver	44 dBA	Noise Level at 2 – 4 Church Road

Table 7.3: 2 – 4 Church Road – Daytime Patron Noise Calculation (09:00 – 22:00).

7.18 Table 7.2 presents a comparison between the predicted immission levels and the period-average ambient noise levels measured at the site in order to classify the long-term impact, as per the guidance of IEMA.

Property	Period	Predicted $L_{Aeq,T}$	Existing $L_{Aeq,T}$	Effect of Patron Noise on Existing Ambient $L_{Aeq,T}$
2 – 4 Church Road	Daytime	44 dB	63 dB $L_{Aeq,16hr}$	- 19 dB – No Impact
	Night-time	Not Operational		

Table 7.4: Assessment of Predicted Worst-Case Noise Levels.

- 7.19 It can be seen from the above tables that the worst case noise emissions from the outdoor seating area of the Griffin will lead to no impact on the ambient noise levels impinging on the windows of the proposed residential dwelling.
- 7.20 Glazing arrangements other than those suggested above may be suitable and it is the responsibility of the glazing manufacturer to recommend and provide appropriate systems that meet the desired sound insulation values based on the range of values presented in Table 7.1. We would recommend that glazing proposals be supported by independently tested and certified acoustic data demonstrating that systems (glazing/frames/spandrels and ventilators) meet the minimum acoustic requirements (ventilators in open position).
- 7.21 The above analysis is provided to demonstrate that a design solution that meets the requirements is feasible at the site and the specified glazing performance in Table 7.1 makes sufficient allowances for in-situ flanking and performance losses that might compromise the laboratory published sound insulation values of the glazing/window systems.
- 7.22 The detailed design of the proposed development will have an influence on both the required sound reduction performance and the appropriate selection of glazing units. The aspects of the detailed design that are important are the room dimensions, room finishes, window dimensions and the sound reduction performance of non-glazing elements. However, should the site be finished to a 'standard' specification and include some soft furnishings, the above glazing specifications are considered appropriate.

Ventilation Considerations:

- 7.23 Further to the glazing requirements, ingress of external sounds should be considered in the context of room ventilation requirements.
- 7.24 *Approved Document F* (AD-F 2010 updated 2021 and in effect from 15th June 2022) presents dwelling ventilation rates in terms of the number of bedrooms within each dwelling and describes whole building ventilation (for continuous occupation), intermittent extract ventilation of wet rooms and intermittent purge ventilation throughout the dwelling. Purge ventilation that is required to "*aid the removal of high concentrations of pollutants and water vapour released from occasional activities such as painting and decorating or accidental releases such as smoke from burnt food or spillage of water*". Purge ventilation is intermittent, i.e. required only when such occasional activities occur.
- 7.25 It is generally accepted that an open window provides a reduction in external noise levels of up to 15dB. In light of this and the sound reduction requirements outlined in table 7.1, it can be seen that the target internal noise levels of BS8233:2014 will not be met with partially open windows with noise levels being some 15dB above the desired levels when the windows are open. As detailed within AD-O that whilst it is reasonable to expect overnight that the residents will close their windows at night and acceptable levels could be met it is important that adequate ventilation and protection against overheating is provided.
- 7.26 The Building Research Establishment (BRE) has published an Information Paper on the acoustic performances of passive ventilation systems. IP4/99: *Ventilators: Ventilators and Acoustic Effectiveness* (1999) details a study into the sound reduction performances of fourteen different window mounted trickle ventilators and seven different through-wall ventilators. The measured sound reduction performance, after taking into account flanking sound paths (i.e. sound paths

that do not travel directly through the vent) and the effective area of the ventilator, ranged from 14-46dB.

- 7.27 Passive vents to provide background ventilation are therefore available that meet or exceed the sound reduction required by the glazing elements of an overall performance no less than 37 dB R_{W+Ctr} . Specific design input from a suitably qualified mechanical services engineer will be required to establish the exact type of trickle ventilation product and equivalent free area requirements of each space to ensure that the correct acoustic performance of the products is selected.
- 7.28 Based on guidance with the ANC AVO guide, a level 2 assessment should be undertaken to identify initial risk as this site would be considered 'High' risk, and so reliance on open windows on any elevation for rapid ventilation may lead to adverse effects. Currently it would appear that the neighbouring residential dwellings do not have specific acoustic glazing or alternative ventilation strategies beside openable windows therefore the proposed new build dwelling will offer significantly better residential conditions than the neighbouring dwellings.
- 7.29 We would recommend that alternative overheating and purge ventilation systems are investigated for habitable rooms at the site with the use of mechanical ventilation being considered, and the benefits of these weighted against the other considerations such as cost and scope of works. Should mechanical ventilation and comfort cooling schemes be implemented, these should be reviewed and approved by a suitably qualified acoustician prior to installation to ensure acoustic comfort will be achieved during all operational duties (i.e. daily and purge rates).
- 7.30 Based on the noise levels measured on site, appropriate ventilation systems are outlined in Table 7.3 below in order to ensure the internal noise environment is not compromised.
- 7.31 In order to provide commentary with regards to the noise implications of the overheating strategy, thermal modelling calculation should be undertaken to inform the design team on the type of overheating strategy which will be adopted. The internal noise level would be dependent on the open area required to manage overheating and the time that the element would be required to be open. Based upon open windows being the required strategy the internal noise levels would be above the BS8233 guideline values. As directed in ProPG and AD-O the resident may value having control over the thermal levels in their dwelling over that of the resultant noise level inside the dwelling.

Ventilation System	Whole Dwelling Ventilation	Extract ventilation
AD-F System 1	Trickle vents providing a minimum performance of 36 dB _{dn,e,w}	Intermittent extract fans
AD-F System 3	Continuous mechanical extract (low rate) and trickle vents for supply providing a minimum performance of 36dB _{dn,e,w}	Continuous mechanical extract (high rate) with trickle vents providing inlet air
AD-F System 4	Continuous mechanical supply and extract (low rate)	Continuous mechanical supply and extract (high rate)

Table 7.3 Ventilation Systems guidance

7.32 In the case of mechanical ventilation systems should be designed to meet the internal noise levels as defined CIBSE Guide A (2015) as shown in Table 7.4.

Room Type	L _{Aeq} dB	NR
Living Rooms	35	30
Bedrooms	30	25

Table 7.4: CIBSE Guide A 2015 guidance levels for mechanical building services

8 CONCLUSIONS

- 8.01 Farrell & Clark LLP. has appointed Environmental Equipment Corporation Limited to undertake to support an application for new residential dwellings to be developed as part of redevelopment works of the existing commercial property of 2 – 4 Church Road Caversham..
- 8.02 The assessment has been carried out in accordance with the National Planning Policy Framework and relevant British Standards and provides mitigation to ensure the future occupants of the proposed development are suitably protected against noise.
- 8.03 An assessment has been undertaken to evaluate the impact of expected existing noise sources on the proposed development to allow for the specification of suitably designed facades across the site.
- 8.04 Typical glazing configurations have been provided to ensure the internal noise requirements outlined in BS8233 are achieved based on the expected ambient and maximum noise levels incident on facades. Suitable typical glazing configurations have been presented to show that a design solution is feasible for the site. Suitable passive ventilators are also available to meet typical trickle ventilation rates whilst not compromising the acoustic design of the facade.
- 8.05 The predicted internal noise levels exceed the design criteria with open windows, as may be required for purge ventilation. However, during these infrequent periods it is considered likely that higher noise levels will be acceptable. Alternatively, mechanical ventilation systems could be adopted.
- 8.06 The final designs and detailing of the building facades should be fully reviewed and approved by a suitably qualified acoustician prior to installation.

APPENDIX A

GLOSSARY OF TECHNICAL TERMS

ACOUSTIC TERMINOLOGY

Absorption Classes	The sound absorption of a material is rated from Class A to Class E, where Class A materials provide the highest level of sound absorption.
Ambient Noise Levels	Noise levels measured in the absence of noise requiring control, frequently measured to determine the situation prior to the additional of a new noise source.
dB	Decibel. The logarithmic unit of sound level.
dBA	A-weighted decibel. The A-weighting approximates the response of the human ear.
$D_{nT,w}$	Weighted standardized level difference. A single number quantity of the sound level difference between two rooms. $D_{nT,w}$ is typically used to measure the on-site sound insulation performance of a building element such as a wall, floor or ceiling. Measured in accordance with BS EN ISO 16283-1 and weighted in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	The weighted element-normalized level difference. A single number rating of the sound reduction provided by a sound passing through an individual element. $D_{n,e,w}$ is typically used to define the sound insulation provided by ventilators. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Flanking	Transmission of sound energy through paths adjacent to the building element being considered. For example, sound may be transmitted around a wall by travelling up into the ceiling space and then down into the adjacent room.
Frequency	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4kHz, roughly equal to the range of frequencies on a piano.
Impact Sound	Sound produced by an object impacting directly on a building structure, such as footfall noise or chairs scrapping on a floor.
$L_{Aeq,t}$	The equivalent continuous sound level measured in dBA. This is commonly referred to as the average noise level. 't' is the interval time for the measurement. Typically 't' of 16hrs and 8hrs is used for day and night time ambient noise respectively or 't' is defined by the period of interest in BS4142 assessments.
$L_{A90,t}$	The noise level exceeded for 90% of the measurement period, measured in dBA. This is commonly referred to as the background noise level.
$L'_{nT,w}$	Weighted, standardized impact sound pressure level. A single number rating of the impact sound insulation of a floor/ceiling when impacted on by a standard "tapper" machine. The lower the $L'_{nT,w}$, the better the acoustic performance. Measured in accordance with BBS EN ISO 140-7 and rated in accordance with BS EN ISO 717-2.
NR	Noise Rating. A single number rating which is based on the sound level in the octave bands 31.5Hz – 8kHz inclusive, generally used to assess noise from mechanical services in buildings.
Octave Band	Frequencies are often grouped together into octaves for analysis. Octave bands are labelled by their centre frequency which are: 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz and 4kHz.
Reverberation Time (T_{mf})	Reverberation time is used for assessing the acoustic qualities of a space. It is defined as the time it takes for an impulse to decay by 60dB. T_{mf} is the arithmetic average of the reverberation time in the mid frequency bands (500Hz, 1kHz and 2kHz).
R_w	Weighted sound reduction index. A single number rating of the sound insulation performance of a specific building element. R_w is measured in a laboratory. R_w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Sound Absorption	When sound hits a surface, some of the sound energy is absorbed by the surface material. Sound absorption refers to the ability of a material to absorb sound, rated from 0, complete reflection, to 1, complete absorption.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to the ability of a material to prevent the travel of sound.
Structure-borne transmission	Transmission of sound energy as vibrations via the structure of a building.

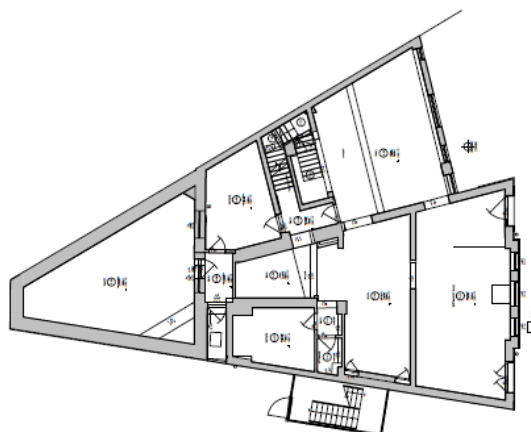
APPENDIX B

**EXISTING AND
PROPOSED FLOOR PLAN**

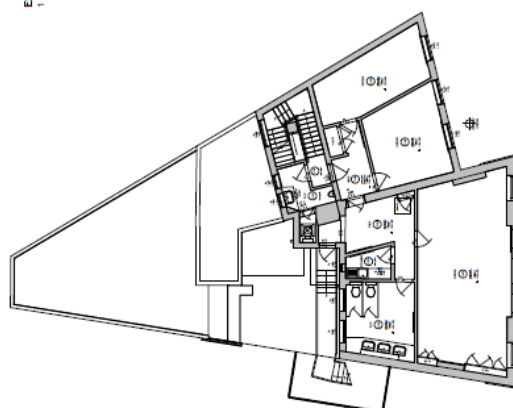
Rev.	Description	Date	By
1	Issued for	09/11/23	SG



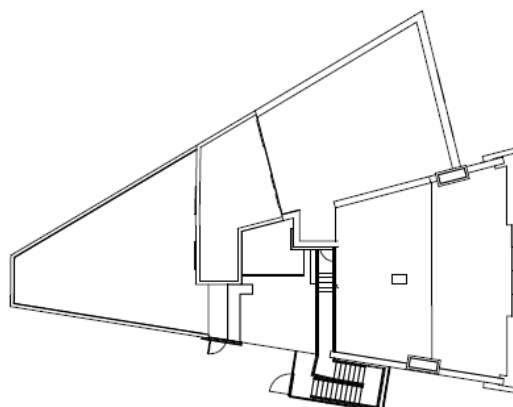
F.C. Farrell & Clark Architects LEEDS 0113 244 0000 www.farrellandclark.co.uk	SG
Client: MF David Bevas	Scale: 1:100
Project: 2-4 Church Rd Caversham RG4 7AE	Date: 09/11/23
Title: Existing Plans	Drawn: AA/OA
Information Name: 00001 FCA-00-22-08-A	Check: OA
	Rev: 101



Existing Ground Floor
1:100



Existing First Floor
1:100



Existing Roof
1:100

FARRELL & CLARK LLP © DO NOT SCALE THIS DRAWING C.A.D. Ref.: -			
Rev	Description	Date	By
-	Preparatory Issue	23.10.20	GA
A	Consent with access door added.	23.10.20	GA
B	Final Shop Sign and Caversham Town	27.10.22	GA
C	Final A & B entrance areas and storage in flat A. Additional flat roof and insulation to be added.	23.10.20	GA
D	Final A & B entrance areas and storage in flat A. Additional flat roof and insulation to be added.	23.10.20	GA

Construction Design Management Regulations 2015

Scale 1:100

Status: Preliminary

Client: Mr David Bevas

Project: 2-4 Church Road, Caversham, RG4 7AE

Title: Proposed Plans

Drawing No.: 5030014-FCA-00-ZZ-OR-A-201-C

Scale: 1:100/8A1

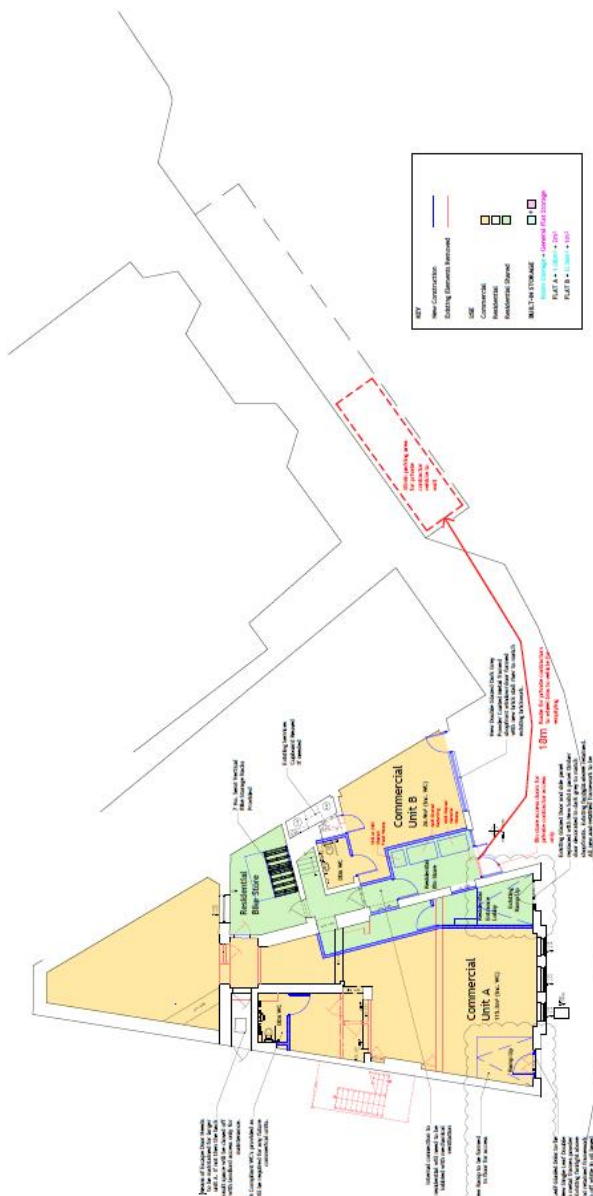
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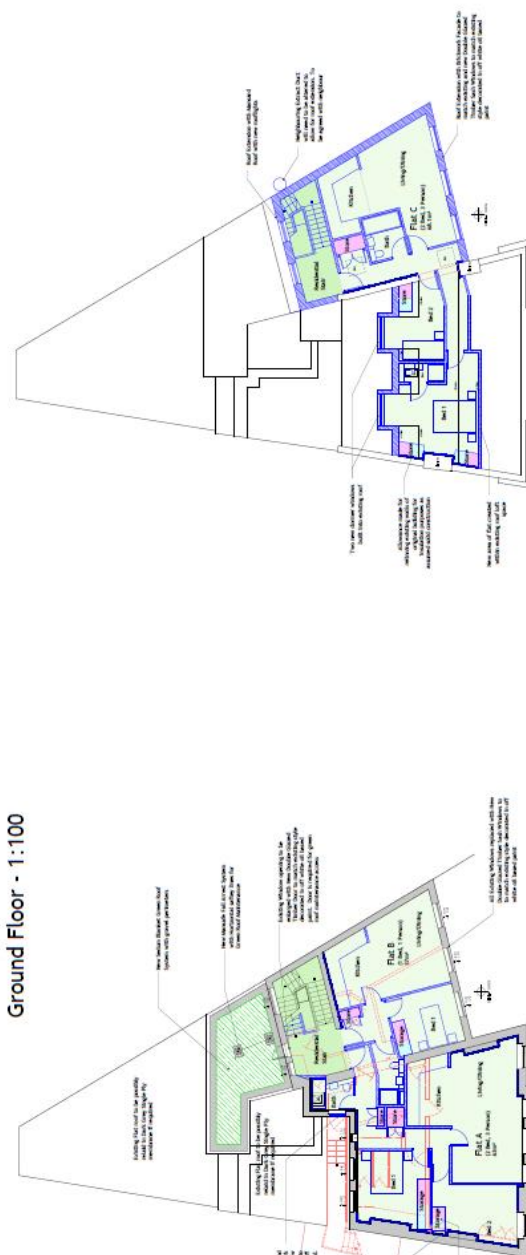
F.C. Farrell & Clark Architects

Luton, Bedfordshire

www.farrellandclark.co.uk



Ground Floor - 1:100



First Floor - 1:100

Second Floor - 1:100

APPENDIX C

SURVEY RESULTS
(TABULAR)

Time	L _{Aeq}	L _{AMax}	L _{A90}
14:45	59.9	70.6	55.4
15:00	59.5	71.1	54.9
15:15	64.5	78.2	60.3
15:30	62.4	74.0	57.9
15:45	61.0	69.3	57.2
16:00	61.2	75.5	56.5
16:15	64.4	89.2	54.5
16:30	64.5	90.8	54.9
16:45	59.4	73.6	53.9
17:00	60.9	77.9	56.7
17:15	62.1	74.6	59.6
17:30	61.6	78.8	59.7
17:45	61.8	70.2	59.5
18:00	61.8	80.3	59.6
18:15	61.7	71.5	59.9
18:30	62.1	76.3	59.7
18:45	61.6	72.6	59.5
19:00	61.5	70.9	59.5
19:15	60.7	69.8	59.2
19:30	61.0	71.7	59.2
19:45	61.8	74.9	59.8
20:00	62.3	78.2	59.5
20:15	62.9	90.2	59.6
20:30	62.1	76.5	59.4
20:45	61.3	68.2	59.0
21:00	62.4	86.1	58.9
21:15	62.0	77.7	58.9
21:30	60.7	66.7	58.8
21:45	61.1	73.0	59.0
22:00	61.3	75.5	58.7
22:15	60.2	73.1	56.4
22:30	62.6	78.9	49.5
22:45	60.7	76.1	48.2
23:00	54.1	67.3	44.5
23:15	55.3	73.1	43.1
23:30	54.0	69.6	42.4
23:45	53.3	74.5	40.9
00:00	52.5	68.2	40.5
00:15	51.3	62.5	38.9
00:30	52.8	72.7	39.3
00:45	52.1	68.2	38.3
01:00	51.7	68.9	40.2
01:15	54.1	71.2	38.4
01:30	51.8	67.9	39.2
01:45	48.6	64.6	37.4
02:00	49.9	68.1	37.9
02:15	49.8	67.6	35.7
02:30	47.5	66.0	34.8

Time	L _{Aeq}	L _{AMax}	L _{A90}
02:45	51.2	70.7	36.8
03:00	48.6	65.7	36.3
03:15	50.4	65.9	35.2
03:30	49.4	66.8	35.3
03:45	48.7	66.9	36.7
04:00	51.2	67.3	39.1
04:15	51.4	66.7	38.9
04:30	65.2	95.1	40.0
04:45	52.8	68.7	40.4
05:00	53.1	66.6	40.0
05:15	55.0	69.2	41.8
05:30	56.4	70.5	44.3
05:45	57.1	70.3	49.0
06:00	58.3	73.7	48.9
06:15	58.8	72.8	51.0
06:30	60.7	72.5	53.1
06:45	60.8	70.9	55.4
07:00	62.1	84.8	55.5
07:15	61.5	76.2	56.6
07:30	60.9	79.9	55.8
07:45	63.3	81.9	56.1
08:00	68.0	96.0	55.5
08:15	59.5	74.0	54.8
08:30	60.5	75.7	55.1
08:45	60.0	75.7	54.4
09:00	68.8	96.6	55.6
09:15	59.8	73.6	54.7
09:30	68.1	93.0	55.4
09:45	61.3	84.9	54.7
10:00	64.1	86.0	54.7
10:15	60.2	78.2	55.0
10:30	62.4	87.1	54.4
10:45	59.0	74.9	54.4
11:00	62.7	85.9	54.7
11:15	62.0	83.2	55.1
11:30	68.5	94.5	54.8
11:45	65.5	89.2	53.5
12:00	60.0	82.0	54.6
12:15	66.2	90.2	54.5
12:30	60.7	77.2	55.8
12:45	64.3	91.9	59.1
13:00	61.7	71.8	59.5
13:15	61.7	74.4	59.4
13:30	61.1	73.6	58.2
13:45	61.5	81.7	57.7
14:00	60.6	72.4	57.8
14:15	60.6	78.5	57.8
14:30	60.5	76.4	57.6

EC 20158 - 2 - 4 Church Road, Caversham

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MP1 - Tabulated Noise data

Sheet 2 of 2

Time	L _{Aeq}	L _{AMax}	L _{A90}
14:45	60.7	75.4	58.1
15:00	69.6	98.5	57.8
15:15	65.3	89.8	56.3
15:30	58.5	71.2	54.6
15:45	59.1	73.5	54.7
16:00	58.0	73.1	52.6
16:15	59.1	73.5	55.1
16:30	58.6	69.3	54.9

Time	L _{Aeq}	L _{AMax}	L _{A90}
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EC 20158 - 2 - 4 Church Road

Farrell & Clark LLP

Tabulated Noise data

Sheet 1 of 2

Time	L _{Aeq}	L _{AMax}	L _{A90}
15:30	71.0	84.7	65.9
15:45	69.2	82.9	64.1
16:00	69.5	89.1	63.6
16:15	72.5	91.1	64.5
16:30	71.8	92.0	62.2
16:45	69.4	89.6	63.5
17:00	68.3	77.6	63.2
17:15	67.4	81.0	62.2
17:30	67.7	80.1	62.4
17:45	67.9	83.6	61.9
18:00	66.8	83.3	60.8
18:15	67.1	81.8	62.4
18:30	67.1	78.2	62.6
18:45	67.8	82.5	62.7
19:00	66.9	79.6	61.7
19:15	66.9	82.7	61.5
19:30	67.2	84.9	60.7
19:45	66.3	81.2	60.8
20:00	68.8	88.4	61.9
20:15	68.4	84.6	60.9
20:30	69.0	93.1	62.0
20:45	67.1	78.8	59.8
21:00	66.8	83.8	58.7
21:15	66.8	84.6	57.8
21:30	65.9	81.2	58.0
21:45	65.8	84.6	56.5
22:00	65.1	82.2	57.2
22:15	65.2	84.6	54.7
22:30	66.1	89.9	55.6
22:45	64.0	77.4	55.8
23:00	62.7	75.9	52.0
23:15	63.5	82.5	49.9
23:30	62.7	81.4	44.4
23:45	61.3	77.2	45.0
00:00	63.2	86.8	42.6
00:15	62.9	85.9	40.8
00:30	59.6	79.0	32.7
00:45	59.8	76.8	33.8
01:00	61.1	76.5	34.3
01:15	59.8	76.1	33.4
01:30	63.0	83.5	31.3
01:45	60.8	81.7	33.6
02:00	55.4	76.0	31.5
02:15	58.5	79.7	31.8
02:30	56.8	79.1	29.4
02:45	59.0	82.5	29.4
03:00	58.3	78.3	32.0
03:15	57.6	79.0	29.6

Time	L _{Aeq}	L _{AMax}	L _{A90}
03:30	58.8	81.0	30.3
03:45	57.8	88.3	28.6
04:00	60.6	84.1	29.6
04:15	60.6	79.4	32.1
04:30	57.8	74.3	32.0
04:45	64.2	89.4	34.1
05:00	60.3	83.5	34.6
05:15	61.9	79.6	41.2
05:30	64.8	85.4	41.9
05:45	64.2	85.1	48.0
06:00	65.1	81.6	51.5
06:15	68.5	88.2	55.1
06:30	67.2	81.1	56.7
06:45	69.0	82.9	59.4
07:00	69.3	87.4	62.0
07:15	70.0	85.3	62.1
07:30	69.7	86.0	63.6
07:45	74.8	99.9	62.5
08:00	69.0	82.8	62.8
08:15	71.4	97.1	61.6
08:30	68.5	82.2	62.9
08:45	68.8	83.8	61.9
09:00	75.2	103.3	61.8
09:15	68.6	85.8	62.8
09:30	73.8	95.4	61.9
09:45	73.1	99.9	62.5
10:00	68.9	90.0	61.8
10:15	71.8	93.0	61.8
10:30	68.6	81.3	62.6
10:45	72.6	99.7	61.6
11:00	67.7	87.0	60.9
11:15	70.2	90.2	61.9
11:30	69.1	88.3	62.5
11:45	73.6	95.4	62.0
12:00	66.8	79.9	61.2
12:15	66.8	78.7	61.6
12:30	72.9	97.7	61.3
12:45	68.0	84.8	62.1
13:00	70.6	102.0	62.0
13:15	67.9	81.3	63.1
13:30	68.6	90.0	62.5
13:45	68.7	88.3	62.3
14:00	68.7	87.9	62.0
14:15	66.9	78.9	60.8
14:30	67.8	94.3	61.8
14:45	66.6	83.9	61.7
15:00	69.3	95.9	61.7
15:15	73.0	95.8	62.0

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Tabulated Noise data

Sheet 2 of 2

Time	L _{Aeq}	L _{AMax}	L _{A90}
15:30	72.4	94.8	62.4
15:45	66.6	83.2	62.1
16:00	67.2	83.5	62.0
16:15	67.4	85.0	60.9
16:30	67.6	86.0	61.8

Time	L _{Aeq}	L _{AMax}	L _{A90}
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APPENDIX D

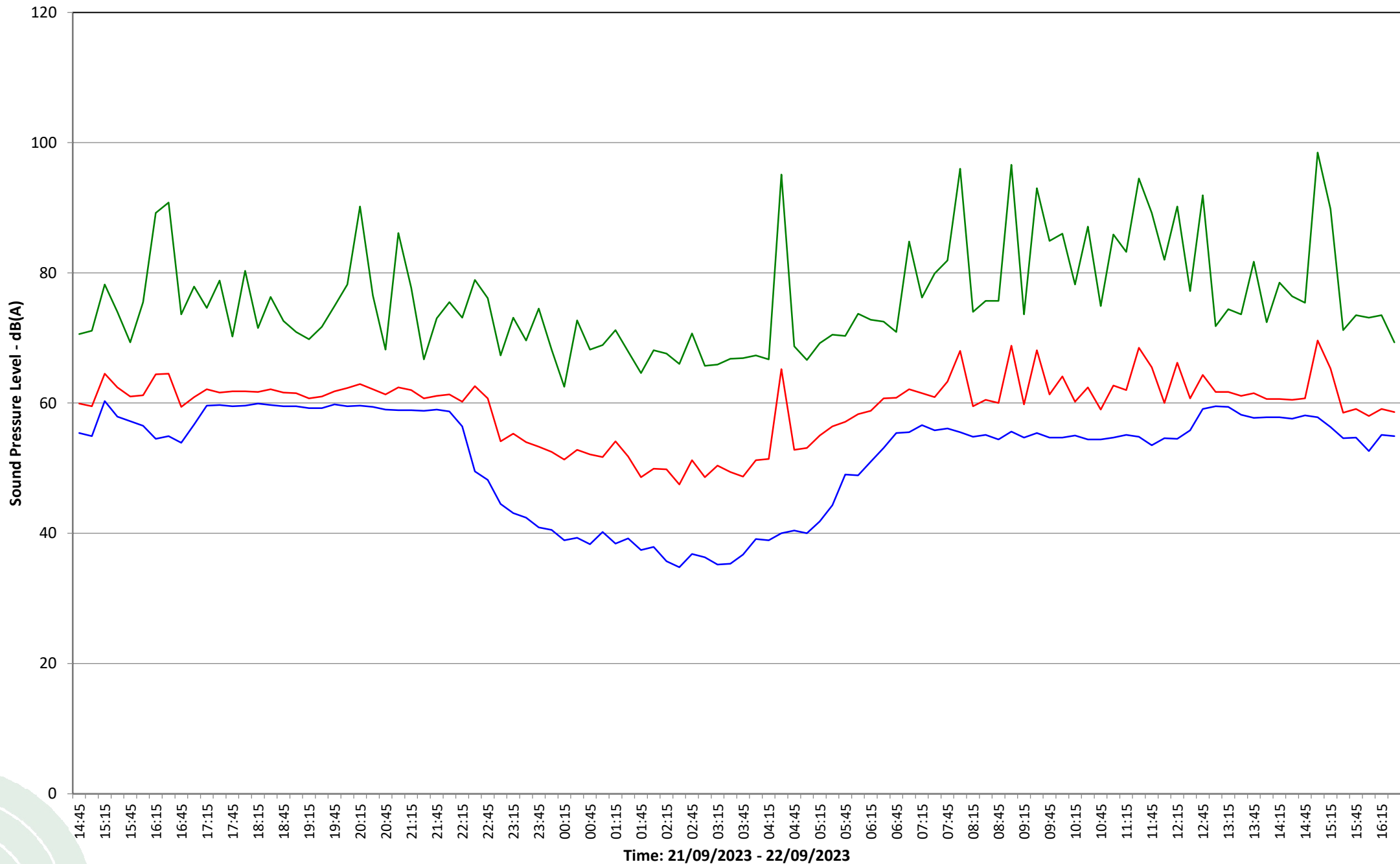
SURVEY RESULTS
(GRAPHICAL)

MP1 - Noise Level Time History at 2 - 4 Church Road, Caversham



Rear Facade

— LAeq — LAFmax — LAF90



MP2 - Noise Level Time History at 2 - 4 Church Road

