

Acoustics assessment

YA149.P1.V3

Change of use from A1 to A5

203 Wilmslow Road

Manchester

M14 5AQ



Manchester, UK

Version 3.0

June 23, 2021

Identification

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Prepared by: Luis Pereira

Prepared for: Afzal Hussain

Revisions

Date	Changes / Comments	Reviser
17/04/2020	Report updated as per Manchester City Council (MCC) comments, received on 09/04/2020	LP
22/06/2021	Sections 4 and 6 updated to consider the new proposed operation hours	LP

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Acronyms

LOAEL Lowest Observed Adverse Effect Level. [7](#), [10](#), [19](#)

MCC Manchester City Council. [2](#), [7](#), [8](#), [10](#), [17](#), [18](#), [19](#)

NOEL No Observed Effect Level. [10](#)

NPPF National Planning Policy Framework. [7](#), [10](#), [19](#)

NPSE Noise Policy Statement for England. [7](#), [11](#), [19](#)

NSR noise sensitive receivers. [7](#), [9](#), [10](#), [19](#)

SLM sound level meter. [12](#), [14](#)

SPL sound pressure level. [16](#)

SWL sound power level. [17](#)

Glossary

D sound level difference - quantity that characterizes airborne sound insulation between rooms, but which is not adjusted to reference conditions, in a stated frequency. [13](#)

L_{A90} A-weighted background sound level - A-weighted sound pressure level obtained using time-weighting “F”, that is exceeded for 90% of the time interval considered. [14](#), [17](#), [18](#)

L_{Aeq} equivalent A-weighted sound pressure level - value of the A-weighted sound pressure level in decibels (dB) of a steady sound that has the same mean-squared sound pressure as the sound under consideration that varies with time. [10](#), [12](#), [14](#), [15](#), [17](#), [18](#)

L_{Aeq,16hr} equivalent A-weighted continuous sound pressure level - value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within the period 07:00-23:00 hours has the same mean-squared sound pressure as the sound under consideration that varies with time. [10](#)

L_{Ar} rating level - specific sound level plus any adjustment for the characteristic features of the sound. [15](#)

L_{Ar,Tr} rating level - specific sound level plus any adjustment for the characteristic features of the sound, for a specified interval over which the specific sound level is determined. [17](#), [18](#)

Summary

This report has been prepared in support of a planning application for a change of use from A1 (shop) to A5 (hot food take away) at 203 Wilmslow Road, Manchester, M14 5AQ. The [MCC Planning & Noise Technical Guidance](#) document [6] sets limits for noise transference, noise break-out and fixed plant noise emissions at nearby [noise sensitive receivers \(NSR\)](#).

A site survey has been carried out to determine the average sound insulation between the proposed development and the vertically adjacent 1st floor studio apartment; and to identify relevant typical background noise levels.

It has been determined that sound insulation levels between the proposed development and the vertically adjacent 1st floor studio apartment are suitable for purpose.

Plant details have been identified by the mechanical engineers and assessed using survey data.

Noise emissions from the proposed plant have been determined and the potential noise impact was calculated and assessed in accordance with BS 4142 [3].

Inlet and outlet duct attenuators, for the proposed extract fan, are required to mitigate noise emissions to a suitable level. The acoustic specification for the required attenuation is shown as Table 1.

Considering the context of the existing acoustic environment the assessment result indicates the likelihood of a low impact, on the basis of implementing the proposed noise control measures. This impact is considered to be a [Lowest Observed Adverse Effect Level \(LOAEL\)](#) in alignment with the [National Planning Policy Framework \(NPPF\)](#) and [Noise Policy Statement for England \(NPSE\)](#) aims.

Table 1 – Attenuators requirements

Attenuator	Octave band (Hz) attenuation (dB)							
	63	125	250	500	1k	2k	4k	8k
Flaktwoods BDER-30 008-030	9	5	13	31	38	41	41	23

1 Introduction

A change of use from A1 (shop) to A5 (hot food take away) is proposed at 203 Wilmslow Road, Manchester, M14 5AQ.

Y-Acoustics Ltd has been commissioned to undertake an assessment of the potential noise impacts associated with the operation of the proposed development in line with the requirements set out by the [MCC](#), as detailed on the letter issued on the 18th of December 2019.

The relevant acoustic requirements have been identified and suitable design solutions and recommendations have been provided accordingly.

2 Proposed development

The proposed development consists of a hot food take away that can host a maximum of 20 patrons and is intended to operate on a daily basis, as follows:

Monday to Saturday From 11:00 hrs to 00:30 hrs; and

Sunday and Bank Holidays: From 12:00 hrs to 00:30 hrs.

Annex A shows the site location and the development architectural layout.

2.1 Noise sensitive receivers

The NSR likely to be the most affected by the proposed change of use are the 1st floor studio apartments which form part of the same building.

Annex C indicates the position of the relevant NSR in relation to the proposed development.

3 Planning policy and relevant criteria

The MCC Planning & Noise Technical Guidance document [6] sets out criteria and guidelines for noise management concerning new development.

The document provides noise level limits which are understood to be between the **No Observed Effect Level (NOEL)** (this is the level of noise exposure below which no effect at all on health or quality of life can be detected) and the **LOAEL** (this is the level of noise exposure above which adverse effects on health and quality of life can be detected) and is therefore in line with the principles of the **NPPF** [7] (see Annex B).

The Sections and criteria included in the Planning & Noise Technical Guidance document, which are relevant for the proposed development, are presented below.

Section 3.6.1.3 Mixed Use Developments:

"Where a planning application includes a proposal to contain a potentially noisy development within the same building as a noise sensitive use or visa versa the noise survey should consider the transfer of noise between the noisy and noise sensitive uses... Consultants should demonstrate that the structure of the development will be sufficient to adequately contain the noise generated within the development..."

No numerical limits are given in this instance and as such, the following criteria is adopted: **L_{Aeq} within living areas of the relevant adjacent NSR (when the hot food take away is operating) ≤ 35 dB L_{Aeq} (which is the typical $L_{Aeq,16hr}$ for a dwelling, as defined in BS 8233 [4])**

Section 3.6.1.5 Industrial/Commercial Developments:

"BS 4142 should be used to assess the likely impact of noise from industrial and commercial sources at noise sensitive premises (section 3.5). One of the indications of the impact of a BS 4142 assessment is the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context

The Council consider that new developments should contribute and enhance the area in which they are located and where possible, contribute to the improvement of people's

health and quality of life as per the NPSE [2]. With this in mind, the design objective should be:

The development should be designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location."

Section 3.6.1.5.1 Noise and vibration from fixed plant/equipment

Noise from fixed plant, equipment or machinery can be very annoying and disruptive to people living nearby particularly where that item involved emits a noise with impulsive or tonal characteristics.

Many of the noise complaints Environmental Health receive about noise from plant, equipment and machinery specifically concern the character of the noise emitted. Any noise assessment needs to consider not only the overall level of noise emitted but also its particular characteristics. The noise assessment should be based on BS 4142: 2014 and any application for fixed plant, equipment or machinery must demonstrate that:

Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location."

4 Site survey

4.1 Sound insulation

A site survey was carried out to determine the current level of sound insulation between the proposed development and the existing 1st floor studio apartment.

The survey was carried out on the 17th of January 2020 in line with the principles and methodology outlined in BS EN ISO 16283 [5].

A steady continuous diffuse sound field was generated within the existing internal areas of the proposed development.

Measurements of L_{Aeq} values over 60 seconds intervals were then carried out within source and receiving rooms, using the manual moving microphone method.

Minimum separating distances of 0.5 m between microphone positions and room boundaries and 1 m between microphone and the sound source were adopted.

An additional measurement was carried out at 1 meter from the existing 1st floor studio apartment front facade, to determine the levels of environmental noise break-out from the proposed development.

An omnidirectional dodecahedron speaker set, a power amplifier and a class 1 [sound level meter \(SLM\)](#), which have current calibration certificates traceable to national standards, have been used.

The equipment was field-calibrated before and after the measurements with no significant drift in sensitivity noted.

Details of the tests carried out are presented as Annex [E](#).

Table 2 – Equipment used

Equipment	Model	Serial no.
Sound Level Meter	SV307	82048
Calibrator	(with built-in calibrator)	
Dodecahedron speaker set	NTi DS3	1013
Power amplifier	NTi PA3	1068

4.1.1 Results

The results of the sound insulation testing are outlined in Table 3.

Table 3 – Measured sound insulation between the proposed development and 1st floor studio apartment

Space	Parameter	Octave band (Hz)						
		63	125	250	500	1k	2k	4k
Internal areas	D dB	33	39	44	52	58	60	67
Front facade (1 meter distance)	D dB	29	32	39	41	42	42	46

4.2 Environmental noise

The environmental noise survey was carried out from the 15th to the 19th of January 2020 in line with BS 7445-2 [1].

The survey was carried out on the 17th and 19th from 21:00 hrs to 23:00 hrs as the background noise was noted to be constant from 22:00 hrs onwards.

Annex F illustrates the positions adopted.

The microphone was placed at a height of 1.5 meters above ground level, away from reflecting surfaces.

The SLM was setup to measure L_{Aeq} values over 1 second intervals and a wind-shield was used as a precaution against interference.

The measurements were carried out in the absence of rain or wind speeds higher than $5m/s^{-1}$.

The same class 1 SLM, as stated on Table 2 was used.

The equipment was field-calibrated before and after the measurements with no significant drift in sensitivity noted.

4.2.1 Results

The results of the site survey are outlined in Table 4.

Table 4 – Measured environmental noise levels

Position 1				Position 2			
Period		L_{Aeq}	L_{A90}	Period		L_{Aeq}	L_{A90}
15/01/2020	09:00-10:00	61	50	17/01/2020	09:00-10:00	52	42
	10:00-11:00	61	51		10:00-11:00	52	42
16/01/2020	09:00-10:00	62	52	19/01/2020	09:00-10:00	53	40
	10:00-11:00	62	51		10:00-11:00	52	41

5 Noise transfer

To determine the expected amount of noise transfer between the proposed development and the 1st floor studio apartment, the typical reverberant noise levels of a busy restaurant¹ - taken from the *The Little Red Book of Acoustics* [8] have been used and are outlined in Table 5.

The results for the expected noise transfer between the proposed development and the 1st floor studio apartment are presented as Table 6.

It can be seen that the expected noise levels are below the limits described in Section 3.

Regarding noise at 1 meter from the 1st floor studio apartment facade, it can be seen that even if penalties are added for intermittency and tonality - which would translate to a total of +7dB - the overall noise levels are still below the required limits.

Table 5 – Typical reverberant noise levels (busy restaurant [8])

Source	Octave band (Hz) SPL (dB)							Global dB(A)
	63	125	250	500	1k	2k	4k	
Busy restaurant	60	70	75	75	75	75	70	80

Table 6 – Calculated noise transmission and break-out at 1st floor studio apartment

Space	Parameter	Limit criteria	Global
Internal areas	L_{Aeq} dB	35	26
Front facade (1 meter distance)	L_{Ar} dB	46	38

¹ This is a worst-case assessment as the restaurant can only host a maximum of 20 patrons and as such the noise levels are expected to be effective lower.

6 Noise from fixed plant

It is understood that the proposed fan system consists of a Flaktwoods 35JM/16/4/522 unit which will be installed at the proposed development rear wall as indicated in Annex G.

Details regarding the unit's noise emissions characteristics are presented as Annex H and Table 7.

Table 7 – Flaktwoods 35JM/16/4/522 noise emission characteristics

Source	Octave band (Hz) SWL (dB)								Global dB(A)
	63	125	250	500	1k	2k	4k	8k	
Outlet	69	70	67	68	61	58	53	48	69
Break-out	59	55	47	47	35	29	28	25	47

To determine the extraction fan unit suitability, noise propagation calculations have been carried out in line with the principles set out in *Smith et al.* [9].

The method and considerations used can be briefly described as follows:

1. Determination of the **sound pressure level (SPL)** emitted by the proposed extract unit at NSR A, in line with the following equation:

$$L_w = L_p + 20\log(r) + 11 \quad (6.1)$$

where:

L_w is the sound power level of the relevant source, in decibels;

L_p is the sound pressure level at the relevant receiver, in decibels;

r is the overall distance between source and receiver, in decibels.

The results for the calculated noise emissions at the rear facade window of the 1st floor studio apartment are stated as Table 8.

Details of the BS 4142 [3] assessment for the unit is presented as Table 9.

The unit is calculated to exceed the required limits and as such mitigation is required.

Table 8 – Noise emitted by fixed plant at the rear facade window of the 1st floor studio apartment

Source	SWL dB(A)	NSR A		
		Distance (m)	Calculated SPL dB(A)	Global dB(A)
Fan outlet	69	4	46	46
Fan break-out	47	4	24	

Table 9 – BS 4142 assessment results (with no mitigation)

Parameter		Commentary
Background sound level	$L_{A90} = 42$ dB (15 min)	The background sound level was measured during quietest times of the day
Specific sound level	$L_{Aeq} = 46$	-
Acoustic feature correction	(4+3)	Additive penalties for both tonality and intermittency in line with BS 4142 subjective methods
Rating level	$L_{Ar,Tr} = 46 + 7 = 53$ dB	
Excess of rating level over MCC criteria	$53 - 37 = 16$ dB	Assessment indicates a likelihood of a significant adverse impact

6.1 Noise mitigation measures

This section details the proposed noise control measures required to mitigate and reduce to a minimum the adverse impacts, to satisfy the MCC requirements.

Calculations indicate that noise levels are mainly emitted by the outlet duct and therefore the proposed mitigation to reduce the specific sound levels is to introduce attenuators to the inlet/outlet ducts of the proposed fan.

The sound attenuation requirements are stated as Table 10. The model reference from Flaktwoods Group is also stated.

Table 10 – Attenuators requirements

Attenuator	Octave band (Hz) attenuation (dB)							
	63	125	250	500	1k	2k	4k	8k
Flaktwoods BDER-30 008-030	9	5	13	31	38	41	41	23

The calculated sound power level (SWL) levels with the proposed attenuator installed are

stated as Table 11.

Table 11 – Flaktwoods 35JM/16/4/522 noise emission characteristics (with proposed attenuator)

Source	Octave band (Hz) sound power level, SWL (dB)								Global dB(A)
	63	125	250	500	1k	2k	4k	8k	
Outlet	60	65	54	37	23	17	12	25	51
Break-out	59	55	47	47	35	29	28	25	47

The calculated specific noise levels, after mitigation are presented as Table 12.

Details of the BS 4142 [3] assessment for the unit, with the proposed mitigation in place, is presented as Table 13.

It can be seen that with the attenuators in place, the resulting noise levels at the 1st floor studio apartment window are significantly below the noise limits set out by the MCC.

Table 12 – Noise emitted by fixed plant at the rear facade window of the 1st floor studio apartment

Source	SWL dB(A)	NSR A		
		Distance (m)	Calculated SPL dB(A)	Global dB(A)
Fan outlet	51	4	28	29
Fan break-out	47	4	24	

Table 13 – BS 4142 assessment results (with mitigation)

Parameter		Commentary
Background sound level	$L_{A90} = 42$ dB (15 min)	The background sound level was measured during quietest times of the day
Specific sound level	$L_{Aeq} = 29$	-
Acoustic feature correction	(3)	Additive penalties for intermittency in line with BS 4142 subjective methods
Rating level	$L_{Ar,Tr} = 29 + 3 = 32$ dB	
Excess of rating level over MCC criteria	$32 - 37 = -5$ dB	Assessment indicates no impacts

Final considerations

Following the assumptions and findings presented in this report, it has been determined that the existing sound insulation between the proposed development and adjacent residential units is in line with the requirements set out by the [MCC](#).

Regarding plant noise, based on the mitigation measures detailed in Section [6.1](#), the calculated BS 4142 rating level at the relevant [NSR](#) is 5 dB below the limits set out by the [MCC](#), and therefore compliant.

Considering the context of the existing acoustic environment the assessment result indicates the likelihood of a low impact, based on implementing the proposed noise control measures. This impact is considered to be a [LOAEL](#) in alignment with the [NPPF](#) and [NPSE](#) aims.

Bibliography

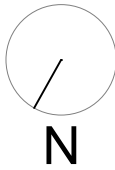
- [1] BS 7445-2:1991, Description and measurement of environmental noise - Part 2: Guide to the acquisition of data pertinent to land use. Standard, BSI, 1991. Cited in page [14](#).
- [2] Noise Policy Statement for England (NPSE). Technical document, Department For Environmental, Food And Rural Affairs, 2010. Cited 2 on pages [11](#) and [29](#).
- [3] BS 4142:2014, Methods for rating and assessing industrial and commercial sound. Standard, BSI, 2014. Cited 3 on pages [7](#), [16](#), and [18](#).
- [4] BS 8233:2014, Guidance on sound insulation and noise reduction for buildings. Standard, 2014. Cited in page [10](#).
- [5] BS EN ISO 16283-1:2014 Field measurement of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation. Standard, BSI, 2014. Cited in page [12](#).
- [6] Planning & Noise Technical Guidance. Technical document, Manchester City Council, 2015. Cited 2 on pages [7](#) and [10](#).
- [7] National Planning Policy Framework. Technical document, Ministry of Housing, communities and local government, 2018. Cited 2 on pages [10](#) and [28](#).
- [8] R. Watson & Owen Downey. *The Little Red Book of Acoustics*. Blue Tree Acoustics, 2012. Cited in page [15](#).
- [9] B.J Smith & Margaret Hollins R.J. Peters. *Acoustics and Noise Control*. Routledge, 2013. Cited in page [16](#).

Annexes

ANNEX A – Site location and proposed layout



Location Plan
Scale 1:500



General Notes:

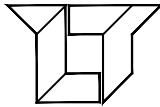
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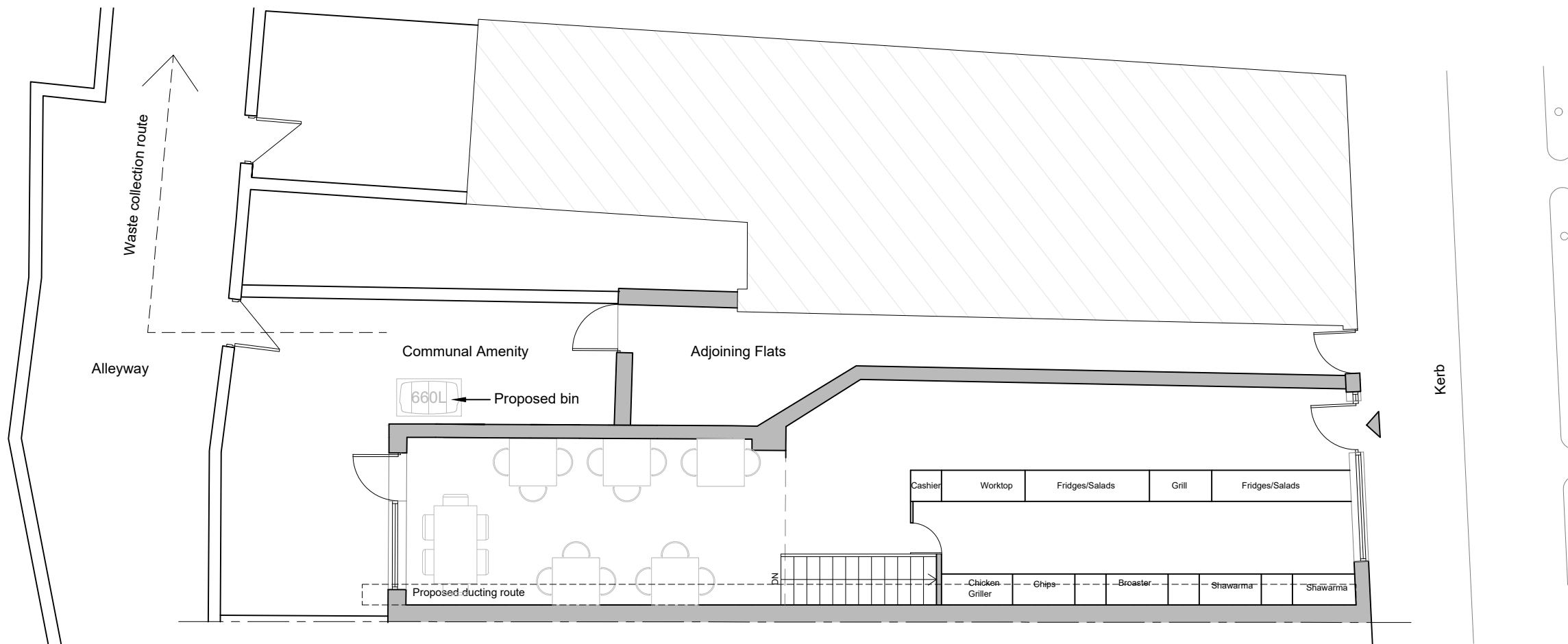
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ARCHITECTURE LTD.
89 Princess Street
Manchester M1 4HT
United Kingdom
T +44(0)161 694 6375
E info@StudioTashkeel.com
www.studiotashkeel.com

client name Firas Mahdi		
project 203 Wilmslow Road		
drawing GA Existing Plan & Section		
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GA Proposed Ground Floor Plan
Scale 1:100



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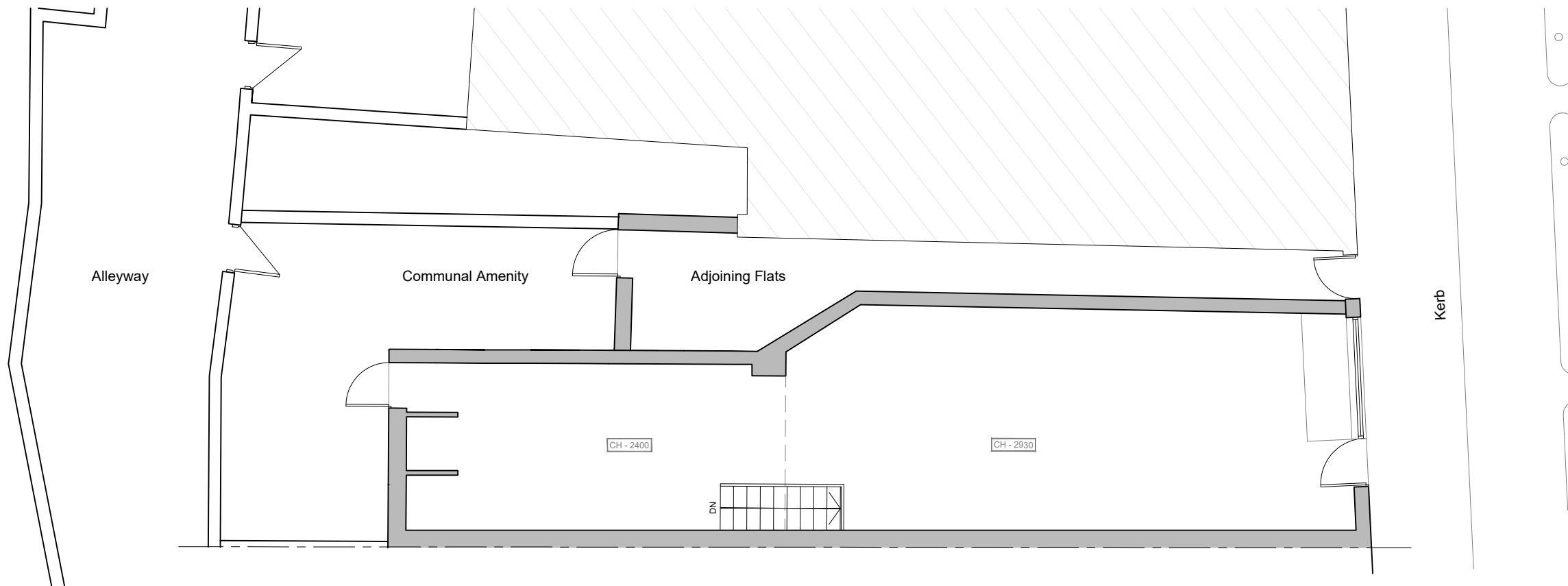
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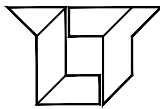
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GA Existing Ground Floor Plan
Scale 1:100

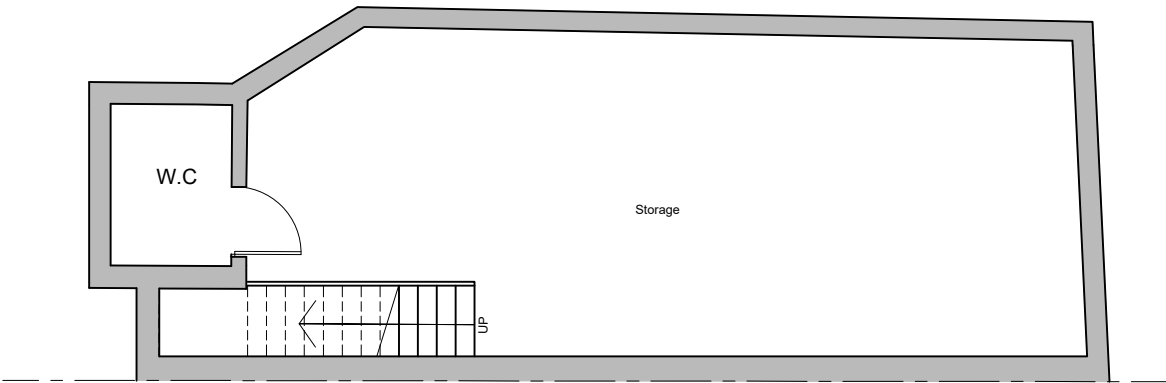
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**STUDIO TASHKEEL
ARCHITECTURE LTD.**
89 Princess Street
Manchester M1 4HT
United Kingdom
T +44(0)161 694 6375
E info@StudioTashkeel.com
www.studiotashkeel.com

client name Firas Mahdi		
project 203 Wilmslow Road		
drawing Existing&Proposed Ground Floor		
project number 1911106	scale 1/100 @ A3	
drawing number PL_002	rev -	issue status PLANNING

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GA Proposed Basement Floor Plan
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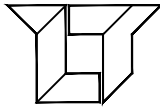
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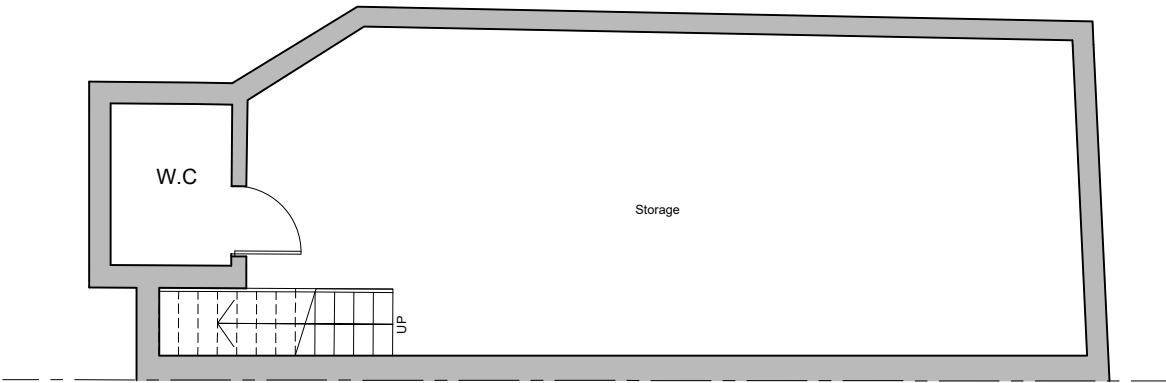
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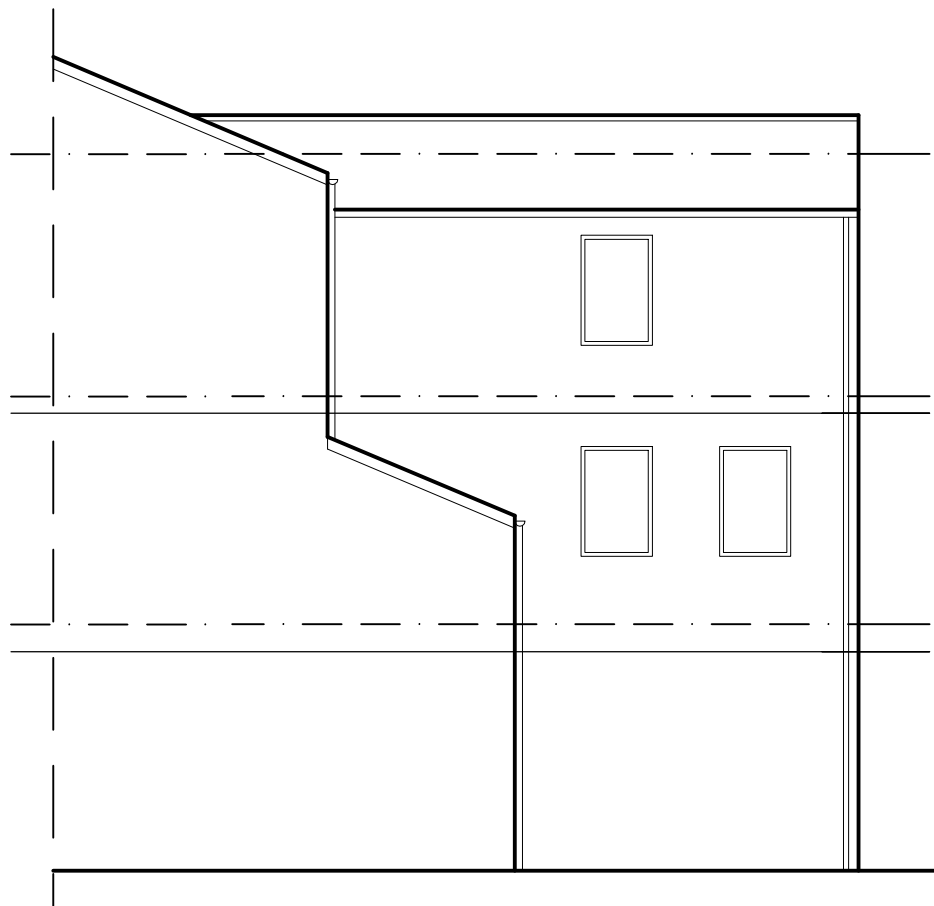


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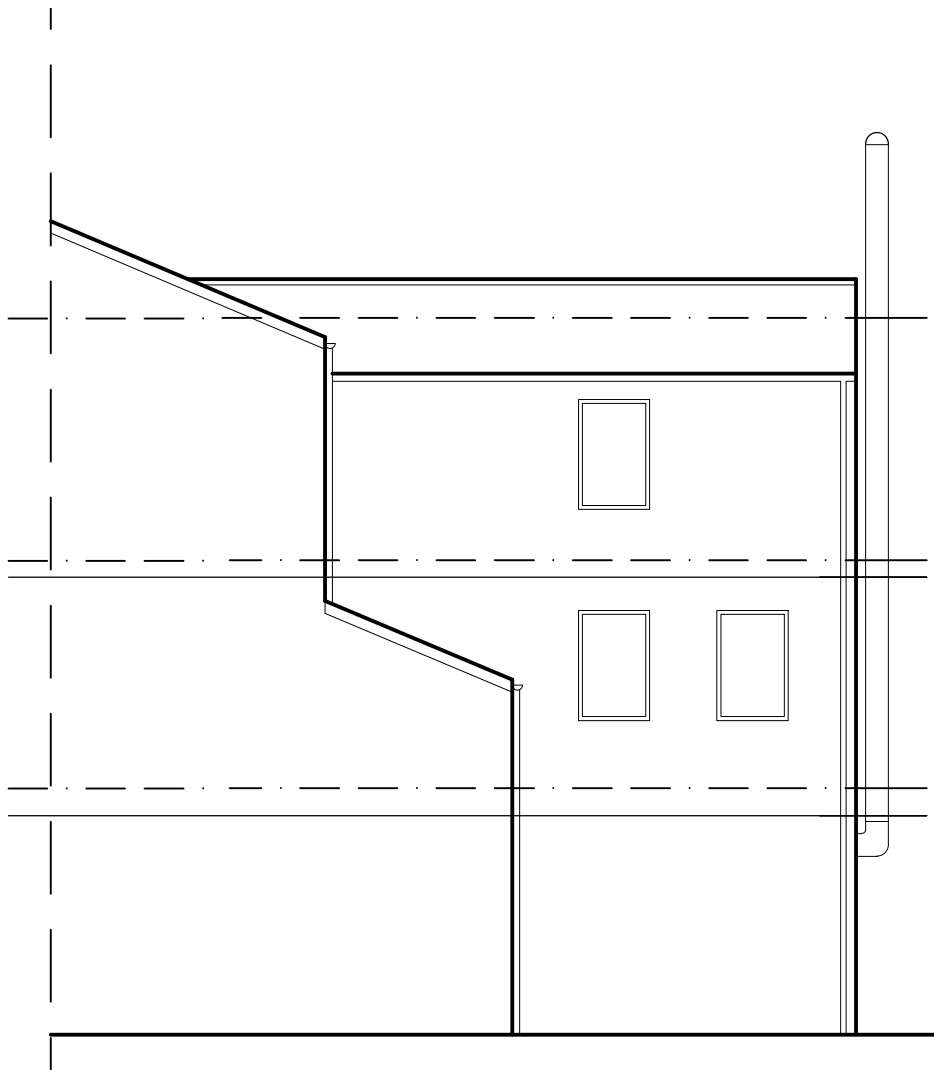


GA Existing Basement Floor Plan
Scale 1:100

client name		
Firas Mahdi		
project		
203 Wilmslow Road		
drawing		
Existing&Proposed Basement Floor		
project number		scale
1911106		1/100 @ A3
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GA Existing Side Elevation Scale 1:100



GA Proposed Side Elevation Scale 1:100

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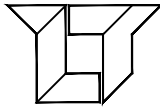
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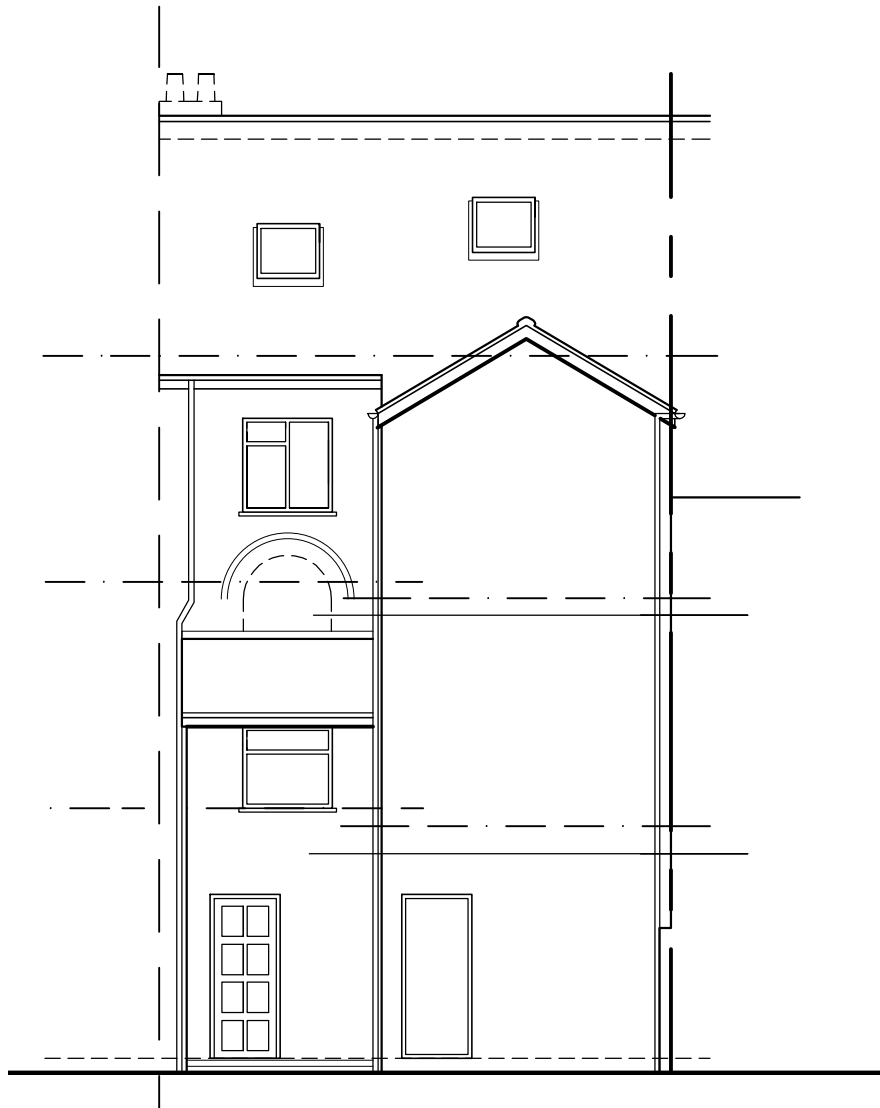
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GA Proposed Rear Elevation Scale 1:100

General Notes:

All site dimensions shall be verified by the Contractor on site prior to commencing any works.

Do not scale from this drawing.

Design intent drawing only. Construction to comply with latest building regulation requirements.

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Rev	Description	Date	Dr by	App by



**STUDIO TASHKEEL
ARCHITECTURE LTD.**
89 Princess Street
Manchester M1 4HT
United Kingdom

T +44(0)161 694 6375
E info@studiotashkeel.com
www.studiotashkeel.com

client name Firas Mahdi		
project 203 Wilmslow Road		
drawing Existing&Proposed Rear Elevation		
project number 1911106		scale 1/100 @ A3
drawing number PL_005	rev -	issue status PLANNING
This drawing is to be read in conjunction with all related drawings. All dimensions must be checked and verified on site before commencing any work or producing shop drawings.The originator should be notified immediately of any discrepancy. This drawing is copyright and remains the property of Studio Tashkeel Architecture Ltd.		

ANNEX B – National Planning Policy

B.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework [7] sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

In regards to noise, Paragraphs 170, 180, 204 and 205 state the following:

170. 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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.

180. 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.

204. Planning policies should:

- g) when developing noise limits, recognise that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction.

205. When determining planning applications, great weight should be given to the benefits of mineral extraction, including to the economy. In considering proposals for mineral extraction, minerals planning authorities should:

- c) ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source, and establish appropriate noise limits for extraction in proximity to noise sensitive properties.

B.2 Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England [2] long term vision is to *"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development"*.

The NPSE states the three following policy aims:

First Aim:

Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development;

Second Aim:

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development;

Third Aim:

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The NPSE uses two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. These are extended to the concept of a significant observed adverse effect level as follows:

NOEL – No Observed Effect Level

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

LOAEL – Lowest Observed Adverse Effect Level

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

SOAEL – Significant Observed Adverse Effect Level

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

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).

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.

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.

ANNEX C – Noise sensitive receivers

• NSR A (1st Floor residences)
Sources: Increased internal ambient noise levels

• NSR A (1st Floor residences window)
Sources: Extract fan/duct



• PROPOSED DEVELOPMENT (Ground Floor)

ANNEX D – Equipment details and calibration certificates

Dodecahedron Speaker Set

Omnidirectional Sound Source



DS3 Dodecahedron Loudspeaker
with speaker stand



PA3 Power Amplifier



DS3 Dodecahedron Speaker with
Carrying Bag and Speaker Cable

The Dodecahedron Speaker Set offers a lightweight, yet powerful signal source for room & building acoustic measurements. The optimized frequency response ensures precise measurements in accordance with the ISO 16283 and the ISO 3382 standards. The set includes the robust omnidirectional DS3 Dodecahedron Speaker and the remote-controlled PA3 Power Amplifier.

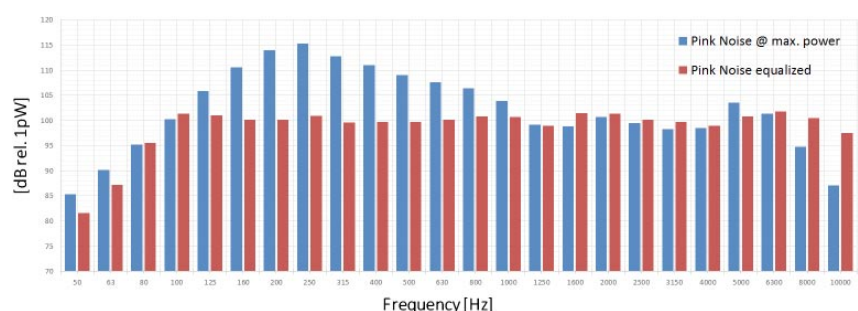
The dodecahedral design arranges 12 high-quality dynamic drivers for a uniform omnidirectional radiation of the acoustic test signal. The DS3 is powered by the portable PA3 power amplifier, which includes a Pink noise generator with an equalized output signal. The equalization ensures that the ISO 16283-1 requirement of ≤ 8 dB difference between contiguous 1/3rd octave bands in the emitted sound is met. The wireless remote control allows the test signal to be switched ON/OFF from outside of the measurement room.

Key Features

- Equalized acoustic frequency spectrum from 100 Hz to 8 kHz
- Maximum sound power typ. 121 dB
- Compact, robust and lightweight
- Wireless remote control

Applications

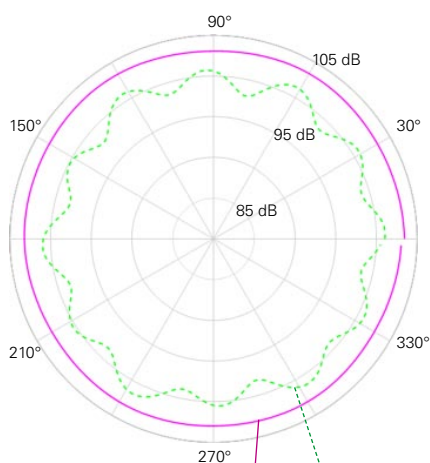
- Room & building acoustics (e.g. reverberation time RT60)
- Airborne sound insulation analysis
- Absorption coefficient testing of building material



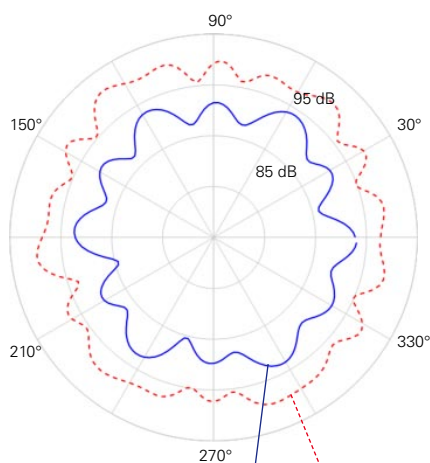
DS3 sound power spectrum



Control panel of PA3 Power Amplifier



Polar Plot of DS3 @ 1 kHz, 2 kHz



Polar Plot of DS3 @ 4 kHz, 5 kHz

All information subject to change without notice.

Specifications PA3 Power Amplifier

Maximum continuous output power	2*150 W into 2*4 Ω with external sine signal @ 0 dBu or Pink noise @ maximum level
Maximum short-term power	2*260 W into 2*4 Ω @ THD $\leq$ 1 %
Protection	Dynamic compressor, temperature, overcurrent, DC, excessive clipping; visual indication via LEDs
Selectable signal sources	- Internal equalized pink noise ($C_f = 2.5$) - External signal, equalized - Internal pink noise, not equalized ($C_f = 3.6$) - External signal without equalization
Gain	-18 dB to 29 dB (via Level control) mute
Power output Dodec configuration Bridge mode (load $\geq$ 8 Ω)	Speakon chn1: 1+ 1-; chn2: 2+ 2- 1+ 2-
Line-In Connector Level sensitivity Max. input level Impedance	XLR (balanced) 0 dBu for rated power into 2*4 Ω 20 dBu (± 11 Vpp) $\geq$ 10 k Ω (balanced)
Subwoofer Line-Out Connector Gain Max. output level Impedance Cut-off filter	XLR (balanced) 3 dB (Line-IN to Subwoofer OUT) 18 dBu (± 8.7 Vpp) $\leq$ 600 Ω 120 Hz low-pass filter Butterworth 24 dB/Octave (4 th order); complementary high-pass filter is automatically switched ON if subwoofer is active
Dimensions (L x W x H)	358 x 173 x 245 mm (14.1" x 6.8" x 9.7")
Weight	5 kg (11 lbs)
Power Supply	100 to 240 VAC, 50/60 Hz, 850 W, fuse T6.3A
Temperature Range	0° to +50°C (32° to 122°F)
Cooling	temperature controlled ultra-low-noise fan
Humidity Range	$\leq$ 90% RH (non-condensing)
Order information	NTi Audio # 600 000 506 (433 MHz) NTi Audio # 600 000 510 (USA, 315 MHz) NTi Audio # 600 000 511 (Japan, 426 MHz)

Specifications DS3 Dodecahedron Speaker

Standards	Compliant with ISO16283, ISO140, ISO3382, ISO354, DIN52210, ASTM-E2235/-E336/-E90
Sound power level	> 120.5 dB re 1 pW (typical 121 dB re 1 pW)
Frequency range	50 Hz to 10 kHz
Input connector	Speakon (chn1: 1+/1- chn2: 2+/2-)
Speakers	12 speakers, 5" each, in dodecahedral configuration
Nominal impedance	2 x 4.2 Ω
Max. short-term peak power	600 W
Maximum input power RMS ¹⁾	320 W
Power compression ¹⁾	< 1 dB
Diameter	350 mm (13.8")
Weight	7.5 kg (16.53 lbs)
Order information	NTi Audio # 600 000 500
Accessories (optional)	Speaker stand 35 mm, 130...230 cm retractable, with carrying bag, NTi Audio # 600 000 508

¹⁾: @ 1 hour continuous maximum power with Pink noise signal, 9 dB crest factor

FACTORY CALIBRATION DATA OF THE SV 307 No. 82048

with microphone SVANTEK type ST30 No. 82588

1. CALIBRATION* (acoustical)

LEVEL METER function; Reference frequency: 1000Hz; Sound Pressure Level: **114.01** dB.

Characteristic	Correct value [dB]	Indication [dB]	Error [dB]
Z	114.01	113.99	-0.02
A	114.01	113.99	-0.02
C	114.01	113.99	-0.02

Calibration measured with the microphone SVANTEK type ST30 No. 82588. Calibration factor: - dB.

2. LINEARITY TEST* (electrical)

LEVEL METER function; Characteristic: A; $f_{sin} = 31.5$ Hz

Nominal result LEQ [dB]	29.0	30.0	31.0	35.0	40.0	60.0	80.0	83.0
Error [dB]	-0.1	-0.1	-0.0	-0.0	0.0	0.0	0.0	0.0

LEVEL METER function; Characteristic: A; $f_{sin} = 1000$ Hz

Nominal result LEQ [dB]	29.0	30.0	31.0	35.0	40.0	60.0	80.0	100.0	120.0	123.0
Error [dB]	-0.1	-0.1	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0

LEVEL METER function; Characteristic: A; $f_{sin} = 8000$ Hz

Nominal result LEQ [dB]	29.0	30.0	31.0	35.0	40.0	60.0	80.0	100.0	120.0	122.0
Error [dB]	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0

3. TONE BURST RESPONSE*

LEVEL METER function; Characteristic: A; $f_{sin} = 4000$ Hz; Burst duration: 2s

Steady level nominal result = 120dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5	0.25
MAX	Fast	Indication [dB]	120.0	119.9	119.0	117.4	115.2	111.7	108.8	105.9	102.0	98.9	95.9	92.9
		Error [dB]	-0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.1	0.0	-0.0	-0.0	-0.1	-0.1
	Slow	Indication [dB]	117.9	115.9	112.5	109.7	106.8	102.8	99.8	96.8	92.9	-	-	-
		Error [dB]	-0.1	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-	-	-
SEL	-	Indication [dB]	120.0	117.0	113.0	110.0	107.0	103.0	100.0	97.0	93.0	89.9	86.9	83.8
		Error [dB]	0.0	-0.0	0.0	0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.1	-0.1

Steady level nominal result = 60dB

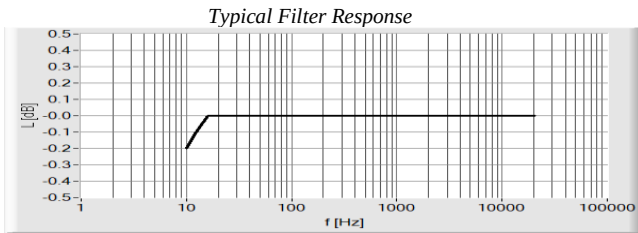
Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2
MAX	Fast	Indication [dB]	60.0	59.9	59.0	57.4	55.2	51.7	48.8	45.9	41.9
		Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0	-0.1
	Slow	Indication [dB]	57.9	55.9	52.5	49.7	46.8	42.8	39.9	36.8	32.9
		Error [dB]	-0.1	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1
SEL	-	Indication [dB]	60.0	57.0	53.0	50.0	47.0	43.0	40.0	37.0	33.0
		Error [dB]	0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	-0.0	-0.0

Steady level nominal result = 40dB

Result	Detector	Duration [ms]	1000	500	200
MAX	Fast	Indication [dB]	40.0	39.9	39.0
		Error [dB]	0.0	0.0	0.0
	Slow	Indication [dB]	37.9	35.9	32.4
		Error [dB]	-0.0	0.0	-0.1
SEL	-	Indication [dB]	40.0	37.0	33.0
		Error [dB]	0.0	-0.0	0.0

4. FREQUENCY RESPONSE* (electrical)

LEVEL METER function; Characteristic: Z; Input signal =120 dB;



Measured Filter Response

(f-frequency, L-level)

f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]
10	-0.1	63	-0.0	4000	-0.0
12.5	-0.0	125	-0.0	8000	-0.0
16	0.0	250	-0.0	16000	-0.0
20	0.0	500	-0.0	20000	-0.0
25	0.0	1000	-0.0		
31.5	0.0	2000	-0.0		

All frequencies are nominal center values for the 1/3 octave bands

5. FREQUENCY RESPONSE (acoustical)

LEVEL METER function; Characteristic: Z; Input: 90 dB;

Frequency [Hz]	20	31.5	63	125	250	500	800	1000	2000
Pressure Response [dB]	-1.0	0.1	0.2	0.1	0.1	0.2	0.2	0.1	-0.1
Free Field Response [dB]	-1.0	0.1	0.2	0.1	0.2	-0.0	-0.1	-0.0	0.4

Frequency [Hz]	3150	4000	5000	6300	8000	10000	12500	16000
Pressure Response [dB]	-0.5	-0.8	-1.1	-1.6	-2.2	-2.7	-2.0	-1.0
Free Field Response [dB]	0.5	0.8	0.7	1.0	0.8	0.6	0.6	1.3

6. INTERNAL NOISE LEVEL* (electrical - compensated)

LEVEL METER function; Calibration factor: 0dB

Characteristic	Z	A	C
Level [dB]	≤23	≤15	≤15

* measured with preamplifier 3 type x No. x.

7. INTERNAL NOISE LEVEL (acoustical - compensated)

LEVEL METER function; Characteristic: A;

Indication [dB]	≤20
-----------------	-----

Noise measured in special chamber, with reference microphone G.R.A.S type 40AN No. 73421

ENVIRONMENTAL CONDITIONS

Temperature	Relative humidity	Ambient pressure
23 °C	27%	998 hPa

TEST EQUIPMENT

Item	Manufacturer	Model	Serial no.	Description
1.	SVANTEK	SVAN 401	65	Signal generator
2.	SVANTEK	SVAN 979	69475	Sound & Vibration Analyser
3.	RIGOL	DM3068	DM30155100773	Digital multimeter
4.	SVANTEK	SV30A	7449	Acoustic calibrator
5.	G.R.A.S.	51AB	200368	Sound Intensity Calibrator
6.	G.R.A.S.	40BP	93296	¼" Pressure Microphone
7.	G.R.A.S.	40AN	73421	½" Free Field Microphone
8.	SVANTEK	SL307	-	Microphone equivalent electrical impedance (18pF)

CONFORMITY & TEST DECLARATION

- Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them.
- The acoustic calibration was performed using the Sound Calibrator and is traceable to the GUM (Central Office of Measures) reference standard - sound level calibrator type 4231 No 2292773.
- The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Calibration specialist: Ryszard Leoniak

Test date: 2019-03-19

ANNEX E – Sound insulation test details

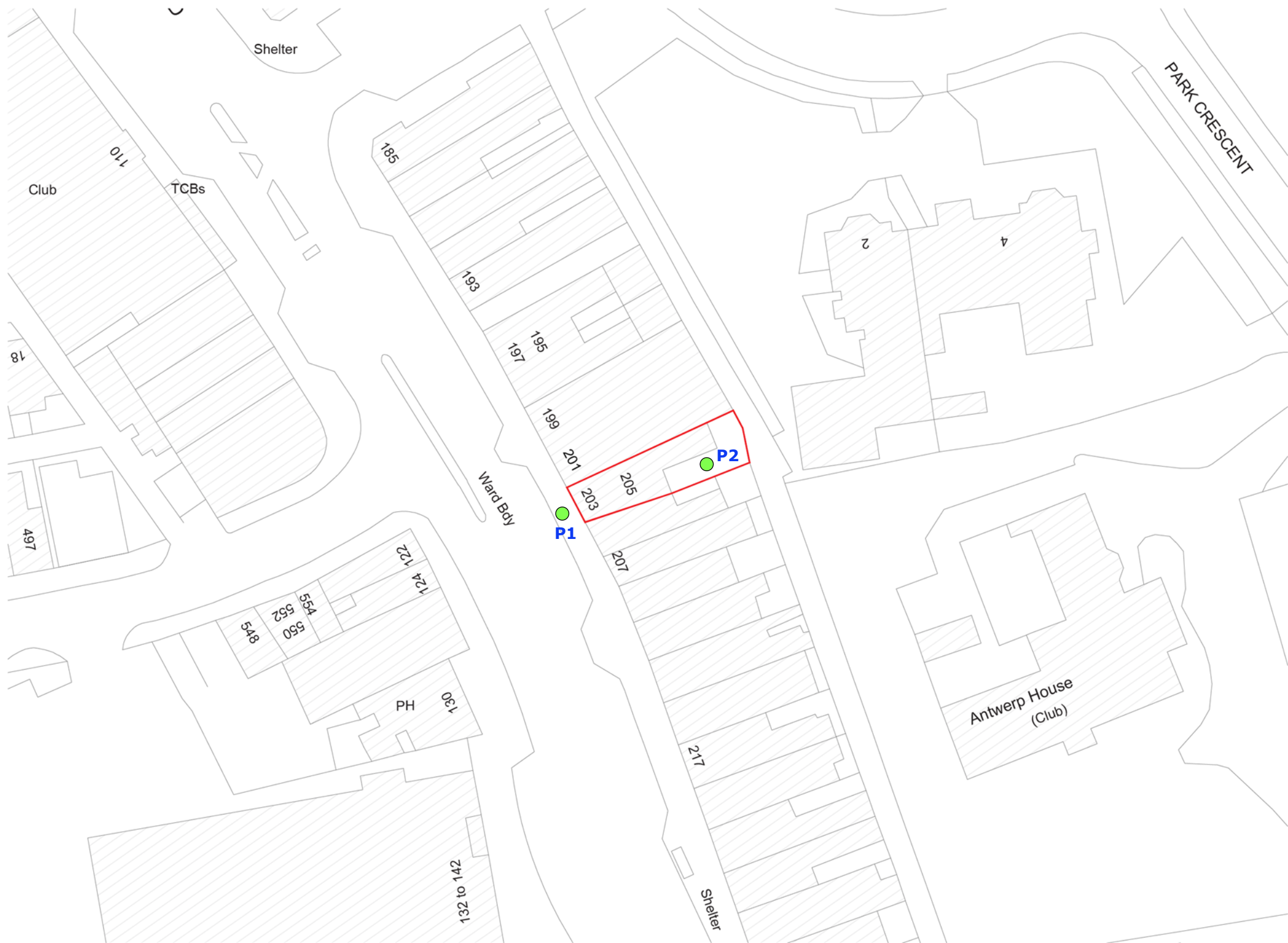


SOURCE ROOM



RECEIVER (STUDIO APARTMENT)

ANNEX F – Environmental noise measurement positions



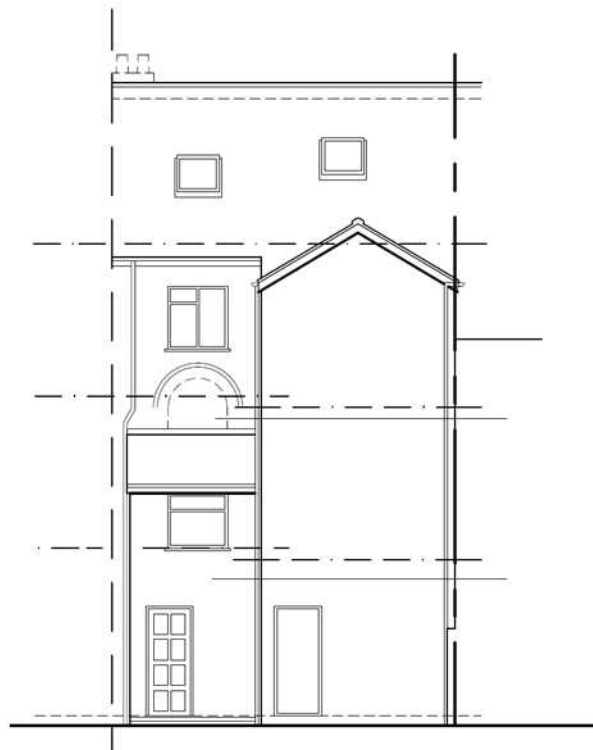
MONITORING POSITION

Height: 1.5 m

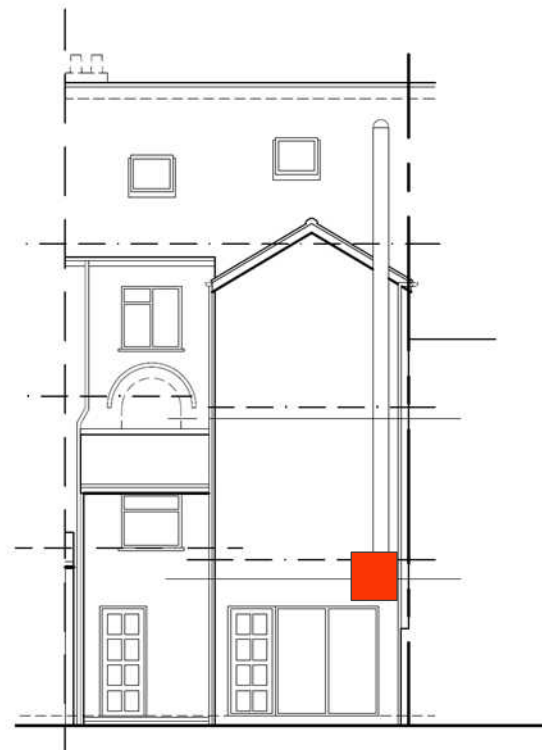
Main sources: Road traffic (Wilmslow Road)

Average wind speed: 2.7 m/s

ANNEX G – Plant location



GA Existing Rear Elevation Scale 1:100



GA Proposed Rear Elevation Scale 1:100

 **PLANT LOCATION**

ANNEX H – Extract fan details



35JM/16/4/5/22/1PH LONG CASED AXIAL FLOW FAN BY FLAKT WOODS

Flakt Woods,

▼ Prices & Options



Overview



Performance



Accessories



Technical Details



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Terms and Conditions: This offer is made subject to the terms and conditions detailed on the accompanying letter.

PRICES & OPTIONS

Code & Description	Price

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T: +44(0)776-937-7068

E: hello@yacoustics.co.uk

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