



Hermes Property Unit Trust

51 CHURCH STREET

ST MARTINS CENTRE, CAVERSHAM





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TYPE OF DOCUMENT: PUBLIC

PROJECT NO. 70034664

OUR REF. NO. E-001

DATE: OCTOBER 2019

Hermes **Property Unit Trust**

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QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	-			
Date	15/10/2019			
Prepared by	Jon Jones			
Signature	 Digitally signed by jon.jones@emeia.w spgroup.com Reason: I am the author of this document Date: 2019.10.11 14:11:00 +01'00'			
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Authorised by	Andrew Jarvis			
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Project number	70034664			
Report number	E-001.1			

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1. INTRODUCTION

- 1.1.1. WSP has been instructed by Hermes Property Unit Trust to provide acoustic design advice to support the planning application for 51 Church Street of the proposed development at the St Martins Centre in the regeneration of Caversham. This report summarises the technical design advice and considers noise issues that may arise from the proposals. It is intended to support the associated planning application and address the requirements of Reading Borough Council.
- 1.1.2. St Martin's Centre is split into separate blocks (A-E) as approved under permission ref 140997, encompassing mixed residential and commercial use. 51 Church Street currently forms part of Block E of the extant planning permissions, and these units are the subject of the revised planning application. The proposal comprise a development above the existing ground floor Waitrose store fronting Church Street.
- 1.1.3. An environmental noise survey undertaken by Cundall has been used to establish the existing noise levels on site as part of the extent permission, to inform the design and to set noise emission limits in accordance with guidance provided by Reading Borough Council. To supplement this an additional noise survey has been undertaken to assist specifically in the design of the cinema.
- 1.1.4. The principle aims of the acoustic design of 51 Church Street which have planning implications are summarised below:
- Control of noise arising from the use of the cinema;
 - Set plant noise limits to be achieved at the most affected sensitive properties based on planning conditions issued by the local authority;
- 1.1.5. This report is necessarily technical in nature and a glossary of technical terminology can be found in Appendix A.

2. SITE DESCRIPTION

2.1. EXISTING SITE

- 2.1.1. The St Martin's Centre is located within Caversham, Reading and is bound to the north by Church Street, to the east by Archway Road, and to the south and west by a mixed use development.
- 2.1.2. The current site for Block E is occupied by Waitrose at ground floor level fronting Church Street, with an office area and gym on the upper floors. A large car park is located to the south at the rear of the site.

2.2. PROPOSED DEVELOPMENT

- 2.2.1. The proposed development forms part of Block E of extant permission 140997 for the regeneration of St Martins Centre, Caversham which seeks to retain the ground floor retail premises and provide the new cinema at first floor level.
- 2.2.2. The revised proposals will deliver a four screen cinema above the existing Waitrose store on Church Street. The cinema will be located across the first floor and will include a bar and function space. It is understood the cinema may want to operate until approximately 0200 hours.
- 2.2.3. External building services plant items associated with the building are proposed to be located within a dedicated plant area on the rooftop. The plant area will be located adjacent to the existing Waitrose plant.
- 2.2.4. The location of 51 Church Street are shown on the site plan included in Appendix B.

2.3. NEAREST NOISE SENSITIVE RECEPTORS

- 2.3.1. The nearest noise sensitive receptors to the proposed cinema have been identified to be:
 - Noise Sensitive Receptor 1 (NSR1): The first floor dwellings on the north side of Church Street which overlook the front of the building. There will be no direct line of sight to the plant location due to the retained pitched roof at the front of the building.
 - Noise Sensitive Receptor 2 (NSR2): Crayshaw Court to the southeast. The existing and retained pitched roof at the rear of the building will provide screening to the majority of rooftop plant.
- 2.3.2. All other noise-sensitive receptors are at a greater distance from the site. As such they will be subject to lower (and in most cases significantly lower) levels of noise from the proposals than those at the receptors identified above and are not discussed further within this report.
- 2.3.3. The locations of the identified noise sensitive receptors are indicated on the proposed site plan within Appendix B.

3. DESIGN CRITERIA

- 3.1.1. This section presents the requirements of the proposed scheme to protect the existing amenity from noise sources with the aim of providing a suitable noise environment in accordance with the requirements of Reading Borough Council (RBC).

3.2. LOCAL AUTHORITY PLANNING REQUIREMENTS

- 3.2.1. The requirements of RBC for the assessment of noise are set out in an internal memo from Jodie Wilson, Senior Environmental Health Office, to Stephen Vigar, dated 24th December 2013, and in further correspondence between Jodie Wilson and Cundall from that date until 14th October 2014. These requirements are detailed in the Cundall 'Environmental Noise Report' (ref. 1006081-RPT-00014) and are summarised below:

NOISE IMPACT ON DEVELOPMENT

- 3.2.2. RBC require that applications for proposed residential developments where there are obvious noise sources, such as roads, should be accompanied by a noise assessment of the external noise environment, identifying noise mitigation measures as necessary. As there are no proposed dwellings as part of this revised scheme this requirement is not considered applicable to this application. There will be a requirement to control the level of noise break-in into the cinema, though this will be an operator requirement rather than a planning consideration.

BUILDING SERVICES NOISE EMISSIONS

- 3.2.3. The RBC Environmental Health Department has confirmed that building services noise emissions should be designed such that the rating level does not exceed the measured background noise level (L_{A90}) at the nearest noise sensitive receptor, when assessed in accordance with BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound'. BS4142: 2014 states that: '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'.

It was also confirmed that building services noise emissions should not exceed the 'good' internal noise levels for dwellings stated within BS 8233: 2014 'Guidance on sound insulation and noise reduction for buildings'. Section 7 of this British Standard includes internal ambient noise levels for dwellings, and these are presented in the following table.

Table 3-1 - BS 8233:2014 guidance on internal ambient noise levels for dwellings

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

NOISE ARISING FROM THE CINEMA (EXCLUDING PLANT)

- 3.2.4. It is proposed that noise limits for the cinema are set such that the average cinema L_{Aeq} noise level does not exceed the existing L_{A90} background noise level outside noise sensitive or residential premises. This approach was agreed with RBC at the time of the original application.

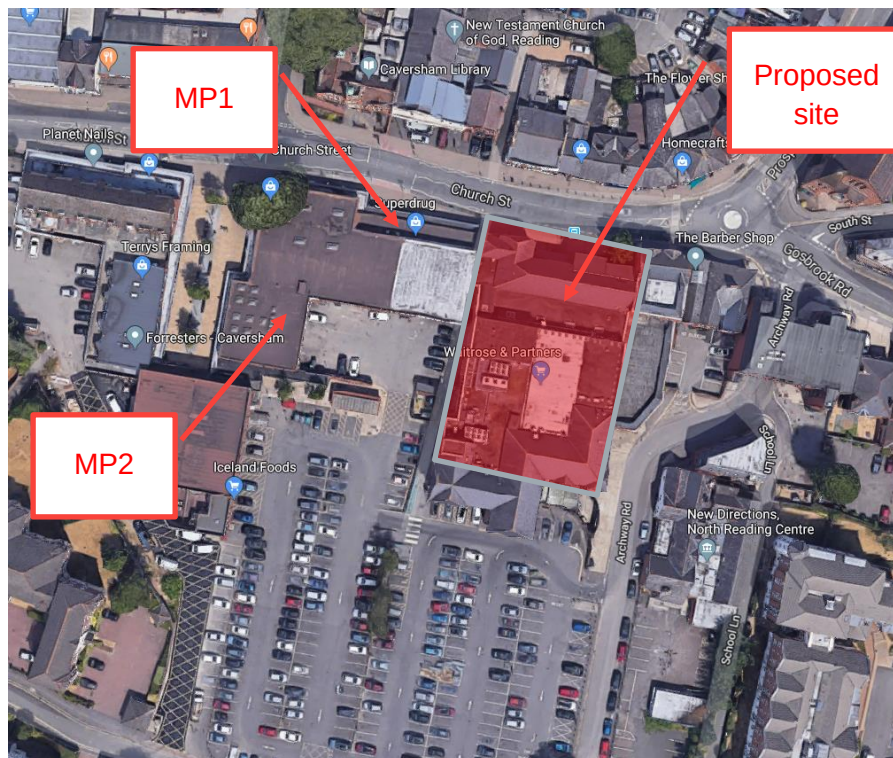
4. ENVIRONMENTAL NOISE SURVEY

- 4.1.1. In order to inform the noise assessment of the site, it is necessary to obtain existing noise levels representative of the nearest noise sensitive receptors to the proposed site, those on the northern side of Church Street. These are required to set appropriate noise emission limits relative to the existing background in accordance the requirements of RBC.
- 4.1.2. An environmental noise survey on the site was previously undertaken by Cundall to inform the planning application for the wider development. It is noted that since this submission the proposed arrangement of the site has been adapted. Although there have been no other known significant developments in the area, to specifically inform the design and assessment of noise from the proposed cinema, an additional and more recent noise survey has been undertaken. A summary of the survey methodology and results are presented below.

4.2. METHODOLOGY

- 4.2.1. The environmental noise survey during the daytime on Wednesday 21st March and Friday 23rd March 2018. Unattended noise monitoring equipment was installed on the northern and southern extents of the flat roof above the former Superdrug store. The measurement positions are indicated in Figure 4-1 and are considered to be representative of the noise climate at the front and rear of the application site.

Figure 4-1: Environmental noise survey measurement positions



- 4.2.2. All measurements were made on a tripod, in free field locations, approximately 1.5 m above the first floor roof level. Weather conditions for the duration of the surveys were generally calm and dry with <5 m/s average wind speeds.

4.3. EQUIPMENT DETAILS

- 4.3.1. Details of the equipment used to undertake the environmental noise survey are presented in Table 4-1 below.

Table 4-1 – Equipment details

Measurement Position	Equipment Description	Manufacturer and Model	Serial Number
Measurement Position 1	Sound level meter	Microtech Gefell GmbH MCE212 Condenser Microphone	10705
	Pre-amplifier	01dB-Stell Solo Master 'Datalogging Integrating Sound Level Meter'	16860
	Microphone	01dB-Stell PRE 21 S Preamplifier	181885
	Calibrator	Microtech Gefell GmbH MCE212 Condenser Microphone	35293350
Measurement Position 2	Sound level meter	01dB-METRAVIB Blue Solo 'Datalogging Integrating Sound Level Meter'	60531
	Pre-amplifier	01dB-MATRAVIB PRE 21 S Preamplifier	16422
	Microphone	Microtech Gefell GmbH MCE212 Condenser Microphone	166401
	Calibrator	01dB-Stell Cal 21	1558662

- 4.3.2. The sound level meters had been calibrated to traceable standards within the preceding two years, and the acoustic calibrator within the preceding 12 months.
- 4.3.3. The sound level meters were located inside a weatherproof case and connected to its microphone via an extension cable. The entire signal chain, including cables, were calibrated prior to, and on completion of, the survey. No significant deviations were found to have occurred. Both microphones were fitted with a windshield.

4.4. NOISE CLIMATE

- 4.4.1. During the time spent on site undertaking the survey, it was observed that the environmental noise climate is generally controlled by local road traffic on Church Street and from the car park at the rear of the site.
- 4.4.2. There is a quantity of existing building services equipment located on the rooftop of Waitrose and in the service yard of other existing retail units. However, this was not considered to be a dominant noise source during the time on site in the daytime.

4.5. NOISE MEASUREMENT RESULTS

- 4.5.1. A time histogram showing the full noise survey results is provided in Appendix C, presenting the equivalent continuous level ($L_{Aeq,15mins}$), the maximum event level ($L_{AFmax,15mins}$), and the background sound level ($L_{A90,15mins}$) for each measurement location.

- 4.5.2. For the purposes of this report, only the ambient and background sound levels are referred to, and only the background levels are used in setting suitable noise emission limits in accordance with the requirements of RBC. A summary of sound levels for daytime and night-time periods are presented in Table 4-2.

Table 4-2 – Summary of minimum measured noise levels

Location	Period	Minimum Ambient Level, dB $L_{Aeq,1hr}$	Minimum Background Level, dB $L_{A90,1hr}$
MP1	Day (07:00–23:00)	63	50
	Night (23:00 – 07:00)	54	37
	Operational hours (08:00 – 02:00)	60	46
MP2	Day (07:00–23:00)	50	46
	Night (23:00 – 07:00)	42	37
	Operational hours (08:00 – 02:00)	44	38

- 4.5.3. The noise levels presented above have been used to determine the acoustic requirements for the cinema in terms of limiting noise emissions to the surrounding area. These are considered to be the lowest representative values whereby the most significant noise impact would be expected, and will be used for the setting of appropriate noise limits in accordance with the planning requirements on RBC.

4.6. DESIGN TARGETS

- 4.6.1. Based on the above and the planning requirements of RBC, the following tables detail the maximum permissible noise levels acceptable in terms of the planning requirements as part of the proposed scheme.

Table 4-3 – Cinema noise emission limits (excluding plant)

Location	Period	Minimum Background Level, dB $L_{A90,1hr}$	Maximum permissible sound level at 1m from NSR, dB L_{Aeq}
NSR 1	Operational hours (08:00 – 02:00)	46	46
NSR 2	Operational hours (08:00 – 02:00)	38	38

Table 4-4 – Plant noise emission limits

Location	Period	Minimum Background Level, dB $L_{A90,1hr}$	Maximum permissible rating level at 1m from NSR, dB L_{AR}
NSR 1	Day (07.00–23.00)	50	50
	Night (23:00 – 07:00)	37	37
	Operational hours (08:00 – 02:00)	46	46
NSR 2	Day (07.00–23.00)	46	46
	Night (23:00 – 07:00)	37	37
	Operational hours (08:00 – 02:00)	38	38

5. EXTERNAL BUILDING FABRIC

5.1. CINEMA ENVELOPE

- 5.1.1. The results of the noise surveys have been used to inform an assessment of noise emissions via the building facade.
- 5.1.2. The design team has been involved with an initial consultation with a prospective cinema operator. The operator has provided a detailed specification for their design requirements for the cinema shell. Included within the acoustic requirements are the following items which have been adopted within the overall design criteria.
- The simultaneous influence of all environmental noise sources, for example, but not limited to, aircraft, rail, rain, and road noise (where known at the time), should not exceed NR30 L_1 and NR25 L_{eq} within the auditoria.
 - Sound breakout from the Cinemas to be contained such as to comply with Local Authority criteria.
- 5.1.3. The maximum noise levels detailed in Table 5-1 are to be employed as soundtrack noise limits within the cinema auditoria. These have been agreed with the prospective cinema operator and will be used as a design basis to develop a structural design capable of suitably isolating the cinema acoustically. Highest average L_{Aeq} cinema soundtrack noise levels are expecting to be approximately 5dB less than these maximum levels.

Table 5-1 – Maximum cinema soundtrack noise levels

Octave Band Centre Frequency, Hz	63	125	250	500	1k	2k	4k	8k	dB(A)
L_{Amax} dB	110	105	100	100	100	100	95	90	105

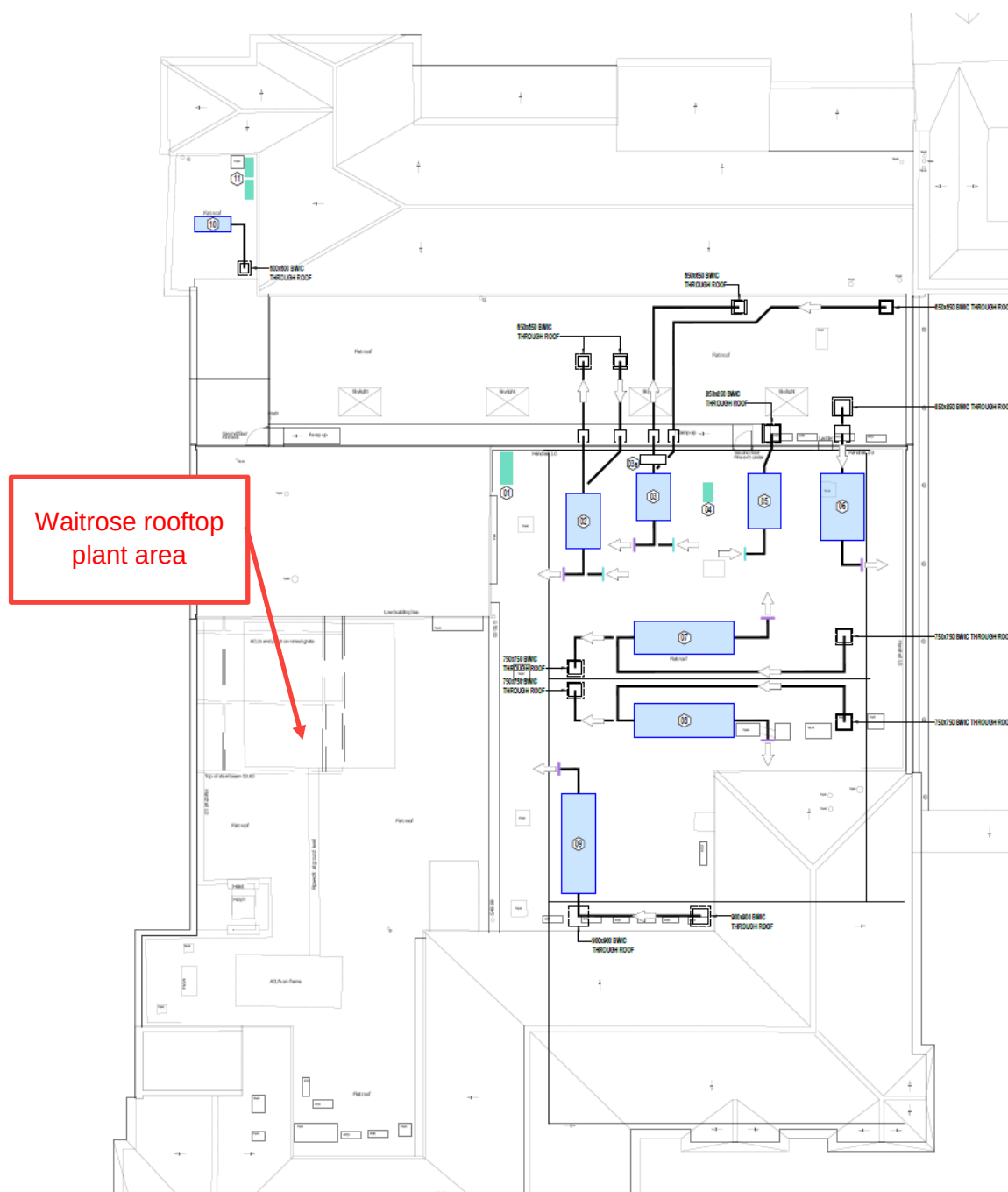
- 5.1.4. A detailed noise assessment is required to ensure suitable levels of noise break-in (for the cinema operator) and noise break-out for planning are achieved. It is expected that both requirements will be achievable with the proposed fully sealed facades and mechanical ventilation strategy.
- 5.1.5. At this stage it is not possible to provide more detailed design information or assessment to confirm the noise targets will be achieved, but the design will be developed covering these aspects of acoustics in due course. It is expected that the design of the auditoria will comprise isolated internal structures, such as a box in box construction, to mitigate the noise transfer to other areas of the building and to outside.
- 5.1.6. It is proposed that a condition be applied at this stage to legislate the level of noise breakout from the cinema to ensure the noise limits detailed in Table 4-3 are not exceeded. Previous discussions with RBC have confirmed that these aspects of the design could be dealt with by condition such that the design principles outlined within the report are followed. WSP are available to discuss the specific wording of the condition, if required.

6. BUILDING SERVICES

6.1. PLANT LOCATIONS

- 6.1.1. It is proposed that the external mechanical services plant is located within a dedicated zone on the rooftop of the new cinema, as shown in Figure 6-1. The plant area will be located adjacent to the existing Waitrose plant space.

Figure 6-1 - Rooftop plant layout



6.1.2. Whilst specific plant items have not been determined at this time, the rooftop plant will comprise the following items:

- 2 x MVHRs;
- 1 x Kitchen supply and extract fans;
- 2 x Toilet extract fans;
- 3 x Auditorium AHUs;
- 3 x Condenser units.

6.2. NOISE LIMITS

- 6.2.1. Atmospheric plant noise limits have been derived based on the requirements of the local authority and the results of the noise surveys. RBC requires the cumulative rating level ($L_{A,T}$) of all proposed plant to be equal to or lower than the measured background noise level at 1 m from the nearest noise sensitive receptor.
- 6.2.2. Based on the lowest measured daytime and night-time background noise levels, noise emission limits for the tenant's plant are presented in Table 4-4.
- 6.2.3. Based on a typical sound level difference for an open window of 15 dB (in accordance with guidance in BS 8233), it can be seen that by designing to the lowest background noise levels at the nearest residential receptors, the resultant internal levels will all satisfy the BS 8233 internal ambient noise levels criteria for dwellings. Therefore the maximum permissible external noise levels will satisfy the additional requirement of RBC.
- 6.2.4. At the time of this application full details and exact specification of the plant items are not available. However, an assessment of the provisional plant selection has been undertaken and shown that with suitable in duct attenuators to the ducted ventilation systems the targets are achievable.
- 6.2.5. Once full specifications are available a detailed assessment will be undertaken assuming a worst-case scenario of all plant items operating simultaneously and at full duty during the relevant operating periods. The assessment shall be undertaken in accordance with the assessment methodology detailed in BS4142:2014.
- 6.2.6. It is proposed that a condition be applied at this stage to legislate the plant noise emissions from the cinema to ensure the noise limits detailed in Table 4-4 are not exceeded. WSP are available to discuss the specific wording of the condition, if required.

7. CONCLUSIONS

- 7.1.1. As part of the regeneration of the St Martins Centre in Caversham a It is proposed the building above the existing Waitrose store is developed into a new cinema. The development is identified as 51 Church Street and is part of approved Block E, at the site.
- 7.1.2. The purpose of the report is to outline design requirements which will be satisfied to ensure the requirements of RBC are upheld, in respect of noise impact of the development on the surrounding areas.
- 7.1.3. Noise levels around the site have been established through an environmental noise survey. The results of these measurements have been used to establish the ambient and background noise levels on site and set design criteria in accordance with RBC's requirements.
- 7.1.4. An assessment has been carried out to assess the potential noise impact the proposal will have on nearby noise sensitive dwellings. Noise breakout and building services plant noise emissions limits have been set at the surrounding noise sensitive receptors, based on the typical background noise levels at the site, to ensure the requirements of RBC are satisfied. Although final plant details are not available at this stage, the design will be developed to incorporate mitigation measures, where required.
- 7.1.5. It is concluded that the noise environment at the site does not preclude the proposed development. It is believed that planning permission for the development could be granted, subject to the design criteria detailed in this report being achieved.

Appendix A

ACOUSTIC TERMINOLOGY

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ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

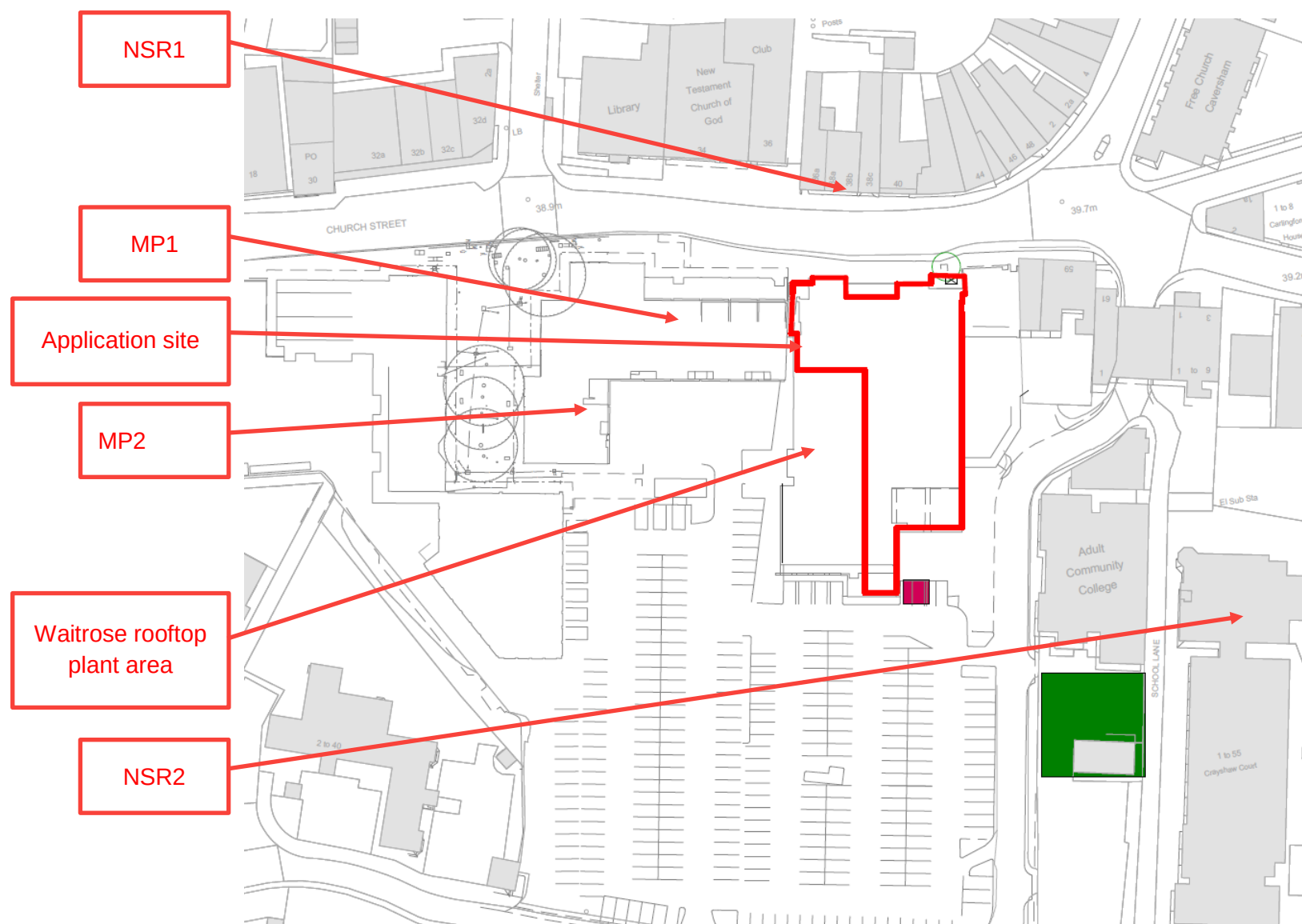
The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Terminology	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20 μ Pa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log ₁₀ (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 μ Pa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
L _{eq,T}	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
L _{max,T}	A noise level index defined as the maximum noise level during the period T. L _{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L _{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L _{90,T}	A noise level index. The noise level exceeded for 90% of the time over the period T. L ₉₀ can be considered to be the "average minimum" noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast/Slow Time Weighting	Averaging times used in sound level meters.
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit.

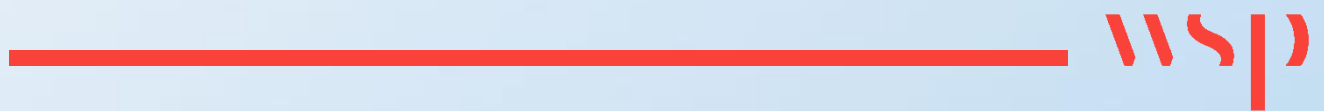
Appendix B

SITE PLAN **wsp**

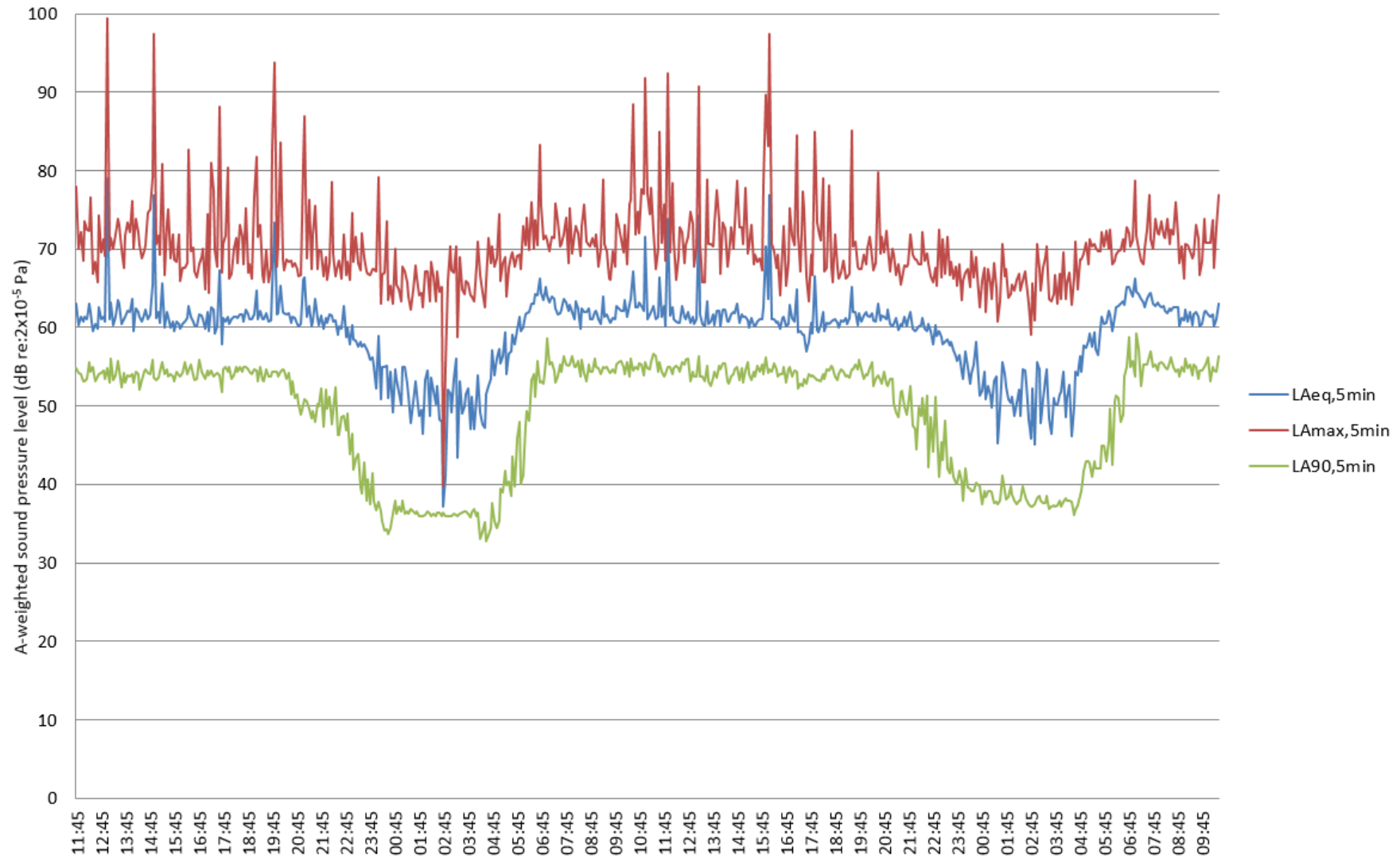


Appendix C

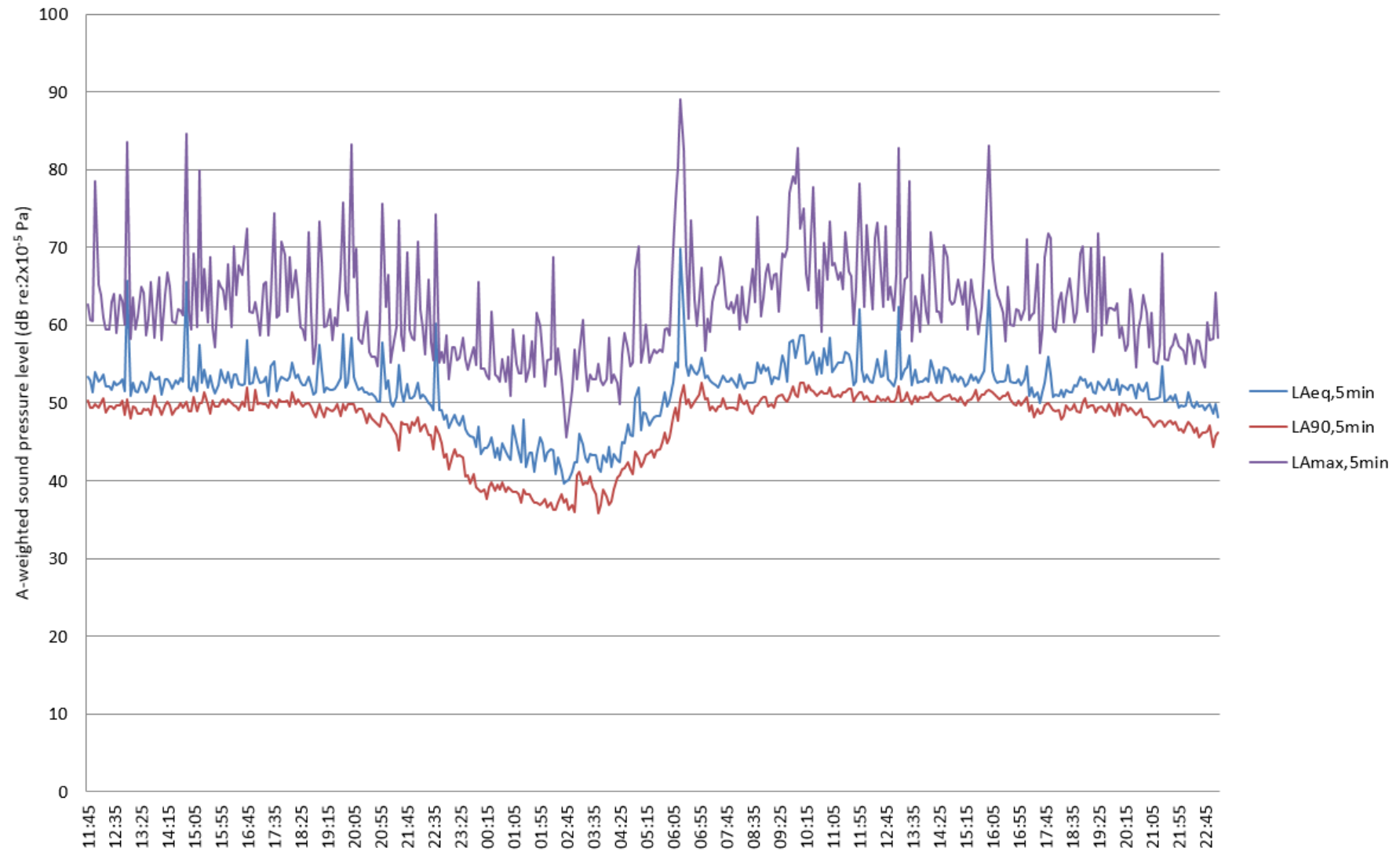
GRAPHICAL NOISE SURVEY RESULTS



MP1 Environmental Noise Survey Results



MP2 Environmental Noise Survey Results





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