



Hermes Property Unit Trust

UNIT 47-49 CHURCH STREET
ST MARTINS CENTRE, CAVERSHAM





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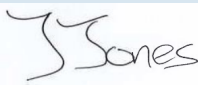
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1 INTRODUCTION

- 1.1.1. WSP has been instructed by Hermes Property Unit Trust to provide acoustic design advice to support the planning application for Units 47-49 Church Street of the proposed mixed use 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. Units 47-49 currently form part of Block E of the extant planning permissions, and these units are the subject of the revised planning application. The proposal consists of an existing ground floor retail area fronting Church Street with a new A3 use restaurant to the rear, and a cinema above. Additionally a number of dwellings will be located across the second, third and top fourth floor of the building.
- 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.
- 1.1.4. The principle aims of the acoustic design of Units 47-49 are summarised below:
- Achieve internal ambient noise levels within the residential, cinema and restaurant unit that are applicable to their use;
 - Provide sufficient levels of sound insulation between spaces adjoining the cinema demise;
 - Control of noise arising from the use of the various commercial units, including tenant activities;
 - Set plant noise limits to be achieved at the most affected sensitive properties based on planning conditions issued by the local authority;
 - Control noise and vibration from building services systems to acceptable levels within the building.
- 1.1.5. This report is necessarily technical in nature and a glossary of technical terminology can be found in Appendix A.

1.2 SITE DESCRIPTION

EXISTING SITE

- 1.2.1. 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.
- 1.2.2. The current site is occupied by Superdrug and a further vacant retail unit at ground floor level fronting Church Street, with back of house areas on the upper floor. A large car park is located to the south at the rear of the site.

PROPOSED DEVELOPMENT

- 1.2.3. The proposed development forms part of Block E of extant permission 140997 for the regeneration of St Martins Centre, Caversham which seeks to retain and extend the ground floor retail premises and provide new residential units. The revised proposals for Units 47-49 specifically include for a new restaurant, cinema and a number for residential apartments.
- 1.2.4. The revised proposals will deliver a new four storey building located centrally at the north of the site, adjoining the existing Waitrose store on Church Street. The cinema will be located across the first to third floors and will include a bar and function space. Residential units will be located from the second to third floors at the front of the site, and across the fourth floor.
- 1.2.5. The residential apartments are to be mechanically ventilated via mechanical ventilation heat recovery units (MVHR), or equivalent systems, which will provide the necessary background ventilation and cooling. This will permit the windows of the dwellings to remain closed generally, except for when purge ventilation is required.
- 1.2.6. External building services plant items associated with the building are proposed to be located within a dedicated plant area on the fourth floor rooftop. The plant area will house both landlord and tenants equipment.
- 1.2.7. The location of Units 47-49 are shown on the site plan included in Appendix B.

2 DESIGN CRITERIA

- 2.1.1. This section presents the requirements of the proposed scheme to protect the existing amenity and future occupants from external noise sources with the aim of providing a suitable internal and external noise environment.

2.2 LOCAL AUTHORITY PLANNING REQUIREMENTS

- 2.2.1. The requirements of Reading Borough Council (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), as included in Appendix C, and are summarised below:

NOISE IMPACT ON DEVELOPMENT

- 2.2.2. 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. The noise assessment should identify the external noise levels impacting on the façade of the proposed dwellings. The external noise levels shall be used to ensure that the design, particularly in terms of glazing and ventilation would control noise levels sufficiently to provide a good quality environment.
- 2.2.3. With regards to ventilation, RBC have stated *"Ventilation measures should be selected which do not allow unacceptable noise ingress and should provide sufficient ventilation to avoid the need to open windows in hot weather, however non-openable windows are not considered an acceptable solution due to the impact on living standards."* Suitable ventilation will be achieved via the use of mechanical ventilation systems in all habitable areas.
- 2.2.4. At the time of the original application RBC referred to BS8233: 1999 'Sound insulation and noise reduction for buildings' and the World Health Organisation (WHO) guidelines for community noise. However, BS8233: 1999 has since been replaced by BS 8233: 2014 'Guidance on sound insulation and noise reduction for buildings' and subsequent discussions with the local authority in respect of the building services noise emissions have confirmed that they now use this updated standard as a guidance document. Therefore as part of this application it is proposed to adopt the internal ambient noise levels detailed within the current document as appropriate criteria within the dwellings. These are shown in Table 1 below.

Table 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 $L_{Aeq,8hrs}$

- 2.2.5. BS 8233:2014 does not state any explicit criteria for L_{max} noise levels, but does provide the following general guidance:
- *"NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values."*
- 2.2.6. The previous version of this standard (BS 8233: 1999) stated that a "For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{Amax} ." This is in line with guidance presented in the World Health Organisation Guidelines for Community Noise. It is standard practice that 'normally' is typically defined up to 15 individual occurrences per night. Therefore it is proposed to adopt this as a design target in this instance to protect the future residential occupants.

- 2.2.7. For this application it is proposed that the glazing specification and ventilation strategy be developed to provide appropriate sound insulation properties to ensure that the internal noise levels detailed in Table 1 are achieved.

BUILDING SERVICES NOISE EMISSIONS

- 2.2.8. 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'.
- 2.2.9. 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'.
- 2.2.10. Section 7 of this British Standard includes internal ambient noise levels for dwellings, and these are presented in Table 1.

NOISE ARISING FROM COMMERCIAL OPERATIONS (EXCLUDING PLANT)

Cinema

- 2.2.11. 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. Given the attenuation provided by residential glazing and the use of mechanical ventilation systems, it is considered that this should provide acceptable internal conditions to dwellings. This approach was agreed with RBC at the time of the original application.
- 2.2.12. However, at the time of the original application there were no plans for residential properties to adjoin the cinema. Given recent design developments and the relocation of the cinema provision above Units 47-49, there is now one dwelling with a party wall to a cinema screen, and a number of dwellings on the fourth floor which have a party floor/ceiling with the cinema.
- 2.2.13. All dwellings within the block will be mechanically ventilated, and consequently the building services noise will provide a constant and predictable background noise level within the apartments. Subsequently it is proposed to set a maximum noise breakout target of 10 dB less than NR 25, assessed in each octave band frequency band between 63 Hz and 8 kHz. This is to be assessed against the L_{Amax} program noise levels generated within the cinema.
- 2.2.14. This design target is based on being at least 10 dB below the minimum anticipated noise levels in each octave band, within each apartment. The otherwise prevailing background noise level will be controlled by the background mechanical ventilation systems.

Restaurant unit

- 2.2.15. No specific criteria in relation to noise from the restaurant were provided by RBC during the original application. However it was proposed in the original application that a tiered approach to noise mitigation be adopted by future tenants, to see that the noise impact is adequately controlled. The following table shows suggested mitigation measures, depending on the use and likely internal activity noise levels.
- 2.2.16. It is considered that these measures remain applicable and are therefore employed as a design requirement for the restaurant unit.

Figure 1 – Suggested mitigation measures for controlling the noise breakout from commercial units

A1 / A3 Internal activities	Mitigation measures
A1 or A3 units with no amplified music / background music, including patron noise	Any new glazing to shop frontages, including doors, to provide ≥ 25 dB R_w
A1 or A3 units with [louder] amplified music Amplified music limited to 90 dB $L_{Aeq,10mins}$ and 105 dB L_{Amax} during normal operation	Internal noise limiter for amplified music calibrated to the limits set Glazing and doors to shop frontages to provide ≥ 40 dB R_w
External seating areas	No amplified music Time restrictions from 08:00 to 23:00 hours Management policy per tenancy on the control of 'noisy/rowdy' behaviour

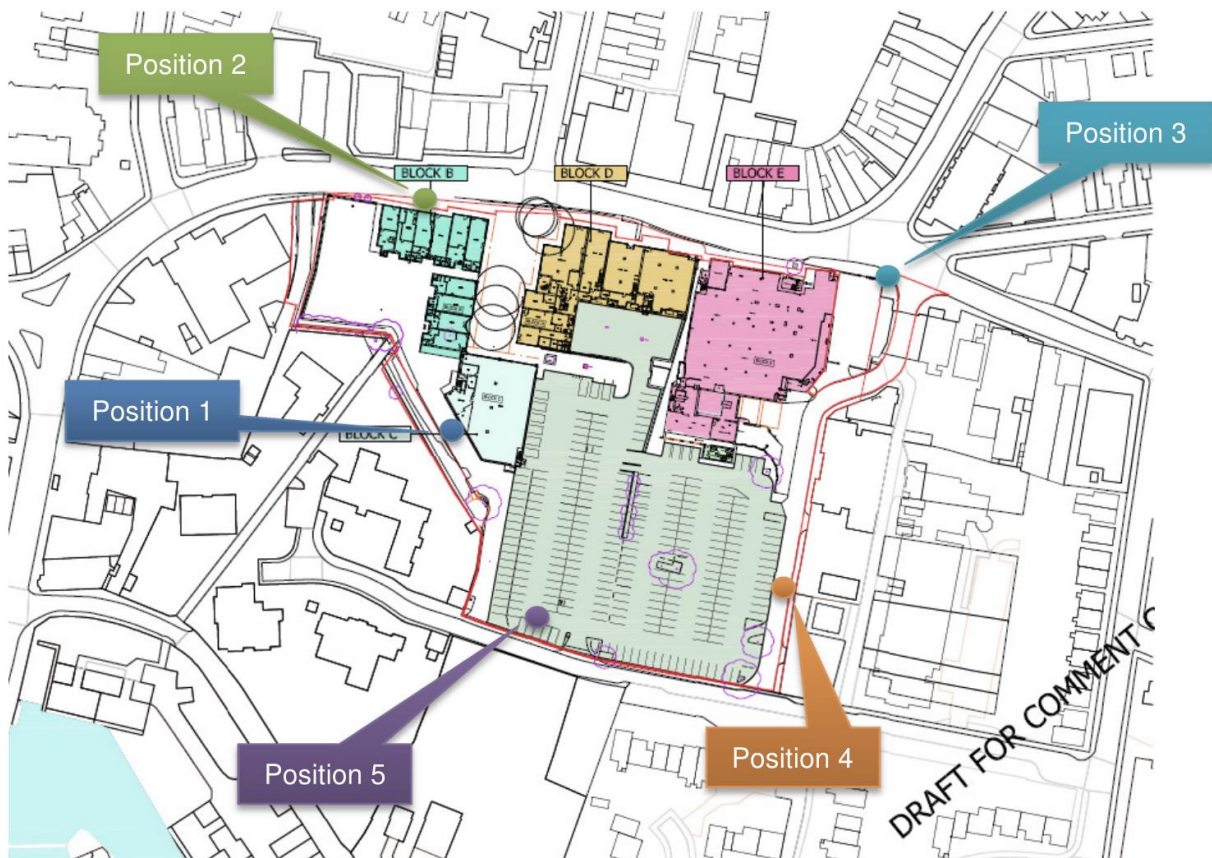
3 ENVIRONMENTAL NOISE SURVEY

- 3.1.1. 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, and those at the proposed location of Units 47-49. These are required to set appropriate building services noise emission limits relative to the existing background and also to assess the suitability of the application site for its intended purpose in accordance the requirements of RBC.
- 3.1.2. 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, however the building massing's has not been significantly changed. Furthermore there have been no other known significant developments in the area and therefore the survey results are considered to remain valid.
- 3.1.3. The full details of the environmental noise survey are included within the Cundall acoustic report which is included in Appendix C of this report for reference. A summary of the survey methodology and results are presented below.

3.2 METHODOLOGY

- 3.2.1. Cundall undertook an environmental noise survey during the daytime on Thursday 7th November 2013, and during the night-time on Thursday 8th May 2014. The measurements are indicated on the site plan in Figure 2.

Figure 2: Cundall environmental noise survey measurement positions



- 3.2.2. All measurements were made on a tripod, in free field locations, approximately 1.5 m above ground floor level. Weather conditions for the duration of the surveys were dry, with no precipitation and <3m/s wind speeds.

3.3 RESULTS

3.3.1. The following table has been extracted directly from Cundall's Environmental Noise Report. It is noted that the night-time measurements were conducted between approximately 01:00 and 04:00 hours.

Figure 3: Environmental noise survey measurement results (Cundall)

Measurement Position / Period		Averaged ¹ $L_{Aeq,T}$	L_{AFmax} ²	$L_{A90,T}$ ³
1	Daytime	51.3	77.3 [53 - 77]	47
2	Daytime	68.8	92.3 [75-92]	60
	Night-time	54.3	77.5 [46-77]	37
3	Daytime	68.1	96.7 [74-96]	67
4	Daytime	59.5	80.3 [66-80]	49
	Night-time	46.6	71.3 [48-71]	42
5	Daytime	54.2	75.3 [61-75]	45
	Night-time	47.6	70.8 [45-70]	41

1. The logarithmically averaged noise measure during the period.

2. Highest L_{Amax} is shown with the range in brackets below.

3. The typical background noise level is determined by taking the highest frequency density when plotted as a histogram. Where two distinct frequency ranges are evident [i.e. at positions 2 and 4, i.e. where daytime and evening background noise levels vary considerably], the lowest value is recorded.

3.3.2. The noise levels presented above have been used to determine the acoustic requirements for Units 47-49, both in terms of limiting noise emissions to the surrounding area and also façade design to control noise ingress into the proposed building.

3.3.3. As part of the previous application Cundall have developed a 3D noise model of the proposed site which has been calibrated to the existing noise measurements and also future road traffic data. A visual representation of this model and the associated predicted noise levels across the site can be seen in Figure 4.

3.3.4. It is noted that the height of the noise modelling contours has been taken as 1.5m above ground level. This is assumed to represent a worst case and highest noise level, given that the predominant noise source is local road traffic which does not benefit from any significant acoustic screening.

Figure 4 – Cundall noise map showing noise predictions for 2019



4 EXTERNAL BUILDING FABRIC

- 4.1.1. The results of the Cundall noise model have been used in conjunction with the results of the noise surveys to inform an assessment of noise intrusion via the proposed residential façades. Given the construction of the solid elements of the façade and the provision of mechanical ventilation, it is the sound reduction properties of the glazing that will prove the most sensitive to the design.
- 4.1.2. It can be seen from Figure 3 that all daytime noise levels are more than 5 dB greater than the night-time levels measured at the same location. Therefore, given that the internal daytime criterion is only 5 dB less onerous for habitable areas, the glazing and ventilation attenuation requirements will be dictated by the noise levels measured during the daytime.

4.2 RESIDENTIAL VENTILATION AND GLAZING STRATEGY

- 4.2.1. The ventilation strategy for all residential parts of the development can be summarised as follows:
- Background ventilation to be mechanical means, through mechanical ventilation heat recovery units (MVHR) or equivalent. This will prevent the need for windows to be opening during normal conditions.
 - Purge ventilation (e.g. to remove contaminants or odours) will be achieved by opening windows.
 - Additional ventilation required to avoid overheating will also be achieved via the mechanical systems.

4.3 RESIDENTIAL GLAZING SPECIFICATIONS

In order to meet the relevant design criteria for indoor ambient noise levels in the dwellings, a number of glazing specifications have been prepared.

- 4.3.1. The glazing sound attenuation requirements to achieve the design criteria outlined in Section 2 are indicated in Table 2. The glazing sound attenuation requirements are quoted in terms of $R_w + C_{tr}$, the C_{tr} providing a correction for road traffic noise which is the dominant noise source to affect façades.
- 4.3.2. At this stage of the design these are indicative specifications and as part of the detailed design process detailed noise break in calculations will be undertaken based on the residential apartments locations, layouts and room finishes to ensure the internal ambient noise level criteria will be achieved.

Table 2 – Residential glazing performance requirements

Façade/Location	Predicted noise incident on facade	Glazing sound attenuation requirement	Example glazing configuration
Northern façade	> 65 to ≤ 70 dB	≥ 40 dB $R_w + C_{tr}$	■ 8.8mm Pilkington Optiphon ■ 16mm air gap ■ 12.8mm Pilkington Optiphon
Eastern façade	> 55 to ≤ 60 dB	≥ 30 dB $R_w + C_{tr}$	■ 10mm pane ■ 16mm air gap ■ 4mm pane
Southern façade	< 55 dB	≥ 25 dB $R_w + C_{tr}$	■ Standard thermal double glazing

- 4.3.3. Provided the glazing achieves the above sound insulation performance, suitable internal noise levels should be achieved with windows closed.
- 4.3.4. It was stated in the Cundall acoustic report that the L_{AFmax} noise impact on the proposed residential façades will be around 3 dB lower than measured noise level, due to distance attenuation (measured noise levels were adjacent on the kerb adjacent to the road). Consequently it is anticipated that maximum noise levels during the night-time period would be typically < 75 dBA, based on measurements taken at location 2. This measurement

location is representative of the noisiest northern façade, fronting Church Street, where dwellings will be located.

- 4.3.5. Based on the glazing attenuation above ($40 \text{ dB } R_w + C_{tr}$), this would therefore result in L_{Amax} levels of $< 35 \text{ dB}$ within residential dwellings, which is significantly within the maximum $45 \text{ dB } L_{AFmax}$ criteria.

4.4 CINEMA ENVELOPE

- 4.4.1. 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 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.
- 4.4.2. Consequently a detailed noise assessment is required for this part of the development, to ensure suitable levels on noise break-in and noise break-out. It is expected that both requirements will be achievable with the proposed fully sealed facades and mechanical ventilation strategy.
- 4.4.3. At this stage it is not possible to provide more detailed design information, but the design will be developed covering all aspects of the 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.
- 4.4.4. It is proposed that a condition be applied at this stage to legislate the level of noise breakout from the cinema. 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.

4.5 RESTAURANT DESIGN

- 4.5.1. It is proposed that the ground floor restaurant design be developed to achieve the criteria detailed within Section 4.

5 INTERNAL BUILDING FABRIC

- 5.1.1. The residential areas of the building will be developed to confirm with the requirements of Approved Document E (ADE) of the Building Regulations. The aims of this document are to provide protection against sound from other parts of the building, against sound within a dwelling, and to control reverberation in the common internal parts of the communal residential areas.
- 5.1.2. Whilst not a planning requirement, the Building Regulations provide minimum performance specifications to safeguard the acoustic environment within new and refurbished dwellings. However, whilst the performance standards detailed within the approved document are suitable for structures separating spaces used for normal domestic purposes, it states that a higher standard of sound insulation may be required between spaces used for non-domestic purposes, as will be required adjoining the cinema within Block F.
- 5.1.3. It is proposed that the maximum noise levels detailed in Table 3 are employed as program 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 acoustically separating the cinema from the dwellings in the block.

Table 3 – Maximum cinema program noise levels

Octave Band, 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. As with the façade design, the internal design will require detailed development. However, at this stage it is proposed to develop the cinema auditoria within an isolated structure separated from the rest of the building. Significant structural zones have been allowed for to provide significant sound insulation between the screens and surrounding areas.
- 5.1.5. It is intended that the design criteria detailed in Section 4 are adhered to. This is on the basis of designing the maximum permissible noise breakout to the residential areas to a level of at least 10 dB below the minimum internal mechanical services noise level in every octave band.
- 5.1.6. Whilst further design details are not available at this stage, it is expected that this could be suitably conditioned to any planning approval such that the design principles of this report are followed.

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 northwest of the 4th floor rooftop. The plant area will be enclosed by an acoustic barrier to visually and acoustically screen the equipment. Whilst the specific plant details are not available at this time, it is expected they will include air handling equipment and air conditioning condenser units.
- 6.1.2. Each residential apartment is to be mechanically ventilated. Details of the specific equipment required to facilitate this and its location are not available at this time. However, it will be designed such that the cumulative noise limits detailed in Table 4 below are achieved.

6.2 NEAREST NOISE SENSITIVE RECEPTORS

- 6.2.1. The nearest noise sensitive receptors and their associated windows closest to the proposed plant area have been identified to be:
- Noise Sensitive Receptor 1 (NSR1): Third floor north-facing proposed apartment windows of the development block, directly below the rooftop plant items. There will be no line of sight between the windows and the plant items due to screening offered by the plant area screen and the building itself.
 - Noise Sensitive Receptor 2 (NSR2): Fourth floor east-facing proposed apartment window of the neighbouring residential Block D to the west. There will be no direct line of sight to the plant location due to the plant area screen.
- 6.2.2. All other noise-sensitive receptors are at a greater distance from the proposed plant location. 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.
- 6.2.3. The locations of the identified noise sensitive receptors are indicated on the proposed site plan within Appendix C.

6.3 NOISE LIMITS

- 6.3.1. Atmospheric plant noise limits have been derived based on the requirements of the local authority and the results of the noise surveys.
- 6.3.2. The overall level of plant noise emitted by the development is a combination of plant installed by the landlord and future tenants.
- 6.3.3. RBC requires the cumulative rating level ($L_{A_{r,T}}$) 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.
- 6.3.4. This will be a combined noise level from all plant items associated with Block F, and should therefore include contributions from the landlord and tenant's plant items, including any plant associated with the residential accommodation.
- 6.3.5. It is therefore appropriate to set individual noise emission limits for the cumulative effect of all landlords plant and the cumulative effect of all tenant's plant, each to be 3 dB below the measured background noise level. This will ensure that if a nearby noise sensitive receptor is affected by plant noise from both the landlords and the tenant's plant, the criteria set by RBC will still be achieved.
- 6.3.6. 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.

Table 4 - Plant noise emission limits at 1m from the nearest noise sensitive receptors

Area	Period	Lowest measured background noise levels, L_{A90}	Cumulative plant noise emission limits, $L_{Ar,T}$	Plant noise emission limits to be applied individually to landlord plant and tenant plant, $L_{Ar,T}$
North of site (adjoining Church Street)	Daytime (07:00 – 23:00 hrs)	67 dB	45 dB*	42 dB
	Night-time (23:00 – 07:00 hrs)	37 dB	37 dB	34 dB
South of site	Daytime (07:00 – 23:00 hrs)	45 dB	45 dB	42 dB
	Night-time (23:00 – 07:00 hrs)	41 dB	41 dB	38 dB

*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 would be above the BS 8233 internal ambient noise levels criteria for dwellings. Therefore the maximum permissible external noise level during the daytime has been capped at 45 dB(A) to satisfy the additional requirement of RBC.

- 6.3.7. Given the location of the noise sensitive receptors, it will be the limits which are representative of the north of the site [42dB(A)] which will be applicable to NSR1 and NSR2. However, any plant which might affect noise sensitive properties at the rear of the site should be assessed against the limits representative of this respective area.

6.4 NOISE LEVEL PREDICTIONS

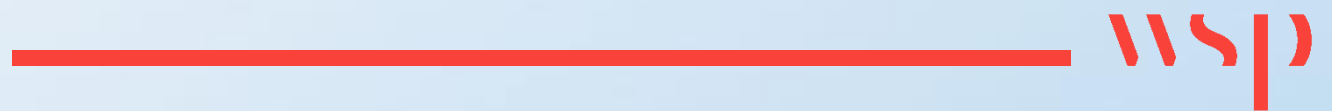
- 6.4.1. At the time of this application full details and exact specification of the plant items are not available. However, once available a detailed assessment will be undertaken assuming a worst-case scenario of all plant items operating simultaneously and at full duty during the relevant operating periods. Assuming the plant has the potential to operate 24 hours a day, the night-time plant noise emission limit is more onerous than the daytime limit and therefore designing to the night-time limit will ensure that the daytime limit is also achieved.

7 CONCLUSIONS

- 7.1.1. As part of the regeneration of the St Martins Centre in Caversham a mixed use block containing a restaurant, cinema and dwellings is proposed. The development is identified as Units 47-49 of the larger development, 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 on the development itself, and impact on the surrounding areas.
- 7.1.1. Noise levels around the site have previously been measured by Cundall, and these have been used by Cundall to create a 3D noise model of the site to accurately predict noise propagation across the complex site from numerous noise sources. 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.
- 7.1.2. An assessment has been carried out to assess the potential noise impact the proposal will have on nearby noise sensitive premises. The assessment also addresses the noise impact on proposed new residential dwellings within the block.
- 7.1.1. Based on the results of the noise survey, glazing attenuation requirements for new build residential dwellings have been set, with suggested glazing specifications and ventilation solutions to ensure the requirements of RBC are achieved.
- 7.1.2. 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 plant details are not available at this stage, the design will be developed to incorporate mitigation measures, where required.
- 7.1.3. It is concluded that the noise environment at the site does not preclude the mixed use development, provided suitable noise mitigation measures as outlined within this report are followed. 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



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.

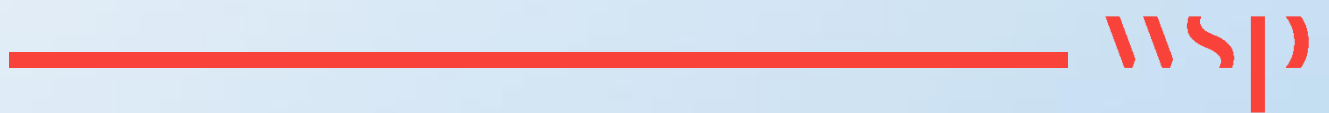
The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

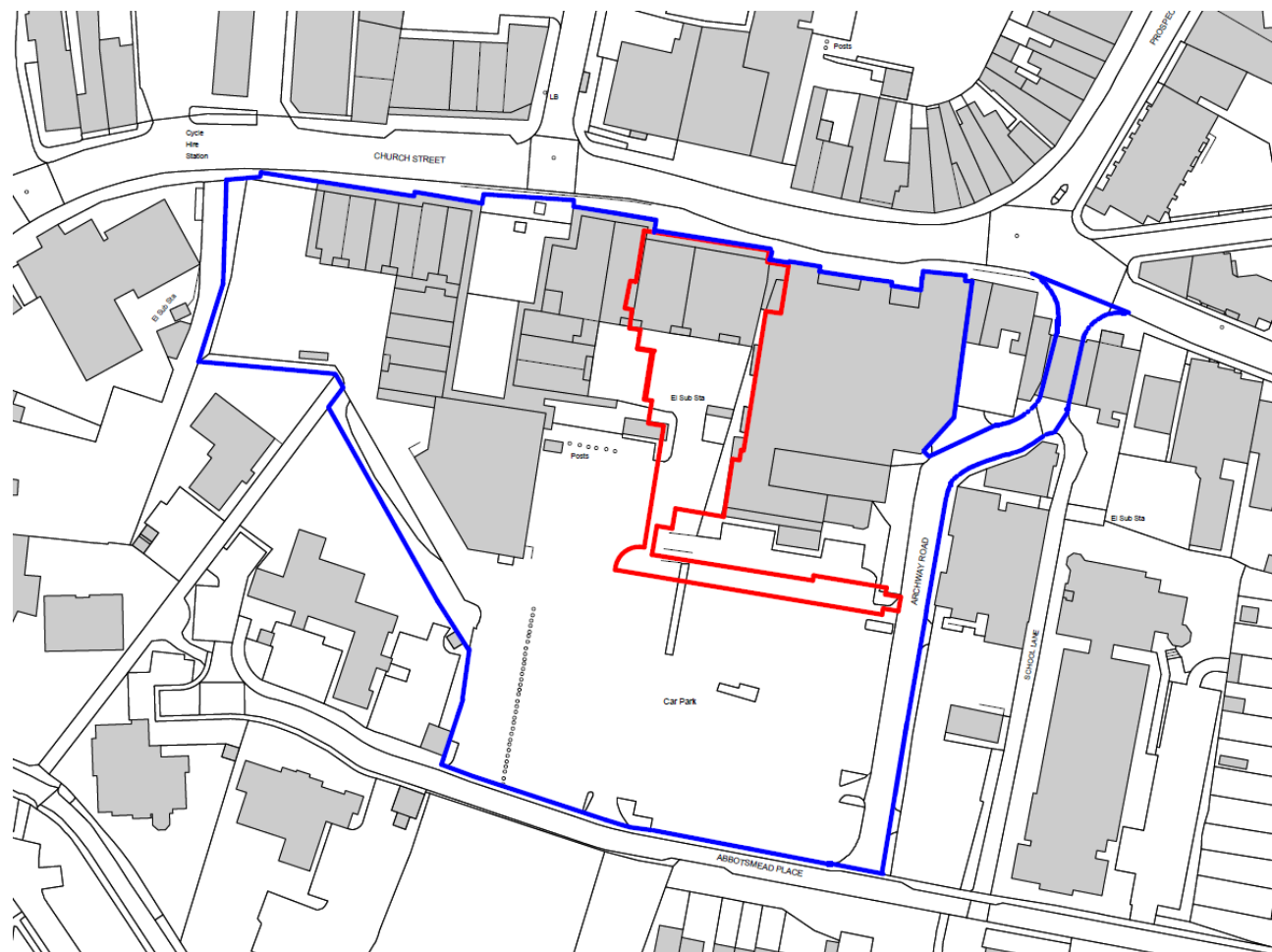
The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order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

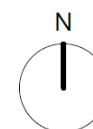
Appendix B

SITE PLAN



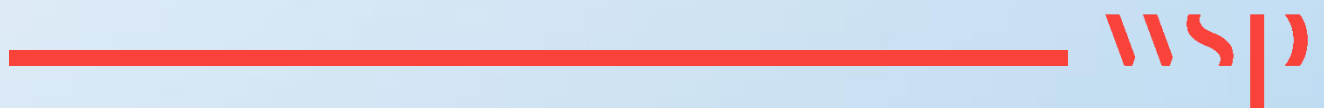


- Denotes St Martin's Centre
- Denotes Block F Application Boundary - 1210 m²



Appendix C

CUNDALL ENVIRONMENTAL NOISE REPORT





Hermes Property Limited Trust

St Martin's Centre Caversham

Environmental Noise Report

Job No: 1006081

Doc No: 1006081-RPT-00014

Latest Revision: A

Date: 17/06/2014

Project name	St Martin's Centre, Caversham	Job Number
Report Name	Environmental Noise Report	1006081

Document Revision History

Revision Ref	Issue Date	Purpose of issue / description of revision
-	23/05/2014	Client comments

Document Validation (latest issue)

Revision A	Issue Date 17/06/2014	Purpose of issue / description of revision / version			
		Outline Planning			
			Prepared by	Checked by	Verified by
		Initials	JW	MRE	MRE
		Signature			

Executive Summary

Reading Borough Council have requested a noise assessment be carried out as part of the proposed regeneration of the St Martin's Centre in Caversham.

The assessment has been made to address issues raised by Jodie Wilson, Senior Environmental Health Office at Reading Borough Council. This included an assessment of the potential noise impact that the development may have on existing noise sensitive premises, in addition to an assessment for mitigation measures required for proposed residential dwellings.

A 3D noise model of the site has been created to accurately predict noise propagation across the site. Using the model, a comparison of traffic flows for the years 2014 and 2019, with and without the development has been made. Both the natural increase in traffic flow and the anticipated increase due to the development result in either 'No change' or 'Negligible' significance criteria, when compared to the classification of magnitude of noise impact set out in the DMRB.

Based on measured noise data, recommended limiting noise levels for breakout noise for A1/A3 units and the cinema have been set, in addition to limiting noise levels for any new items of services plant.

Using the 3D model, and the 2019 With Development scenario, the noise impact on proposed residential dwellings has been assessed. Recommended mitigation measures for glazing and ventilation have been made. On the most exposed façade, overlooking Church Street, the glazing attenuation requirements to achieve an internal noise level of 30 dBA $L_{Aeq,T}$ are 40 dB $R_w + C_{tr}$, with fresh air requirements to be met through mechanical ventilation.

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1. Introduction

Cundall has been instructed by Hermes Property Limited Trust to carry out an assessment of the potential noise issues that may arise from the proposed re-development of the St Martin's Centre in Caversham.

The development site is split into five separate blocks as follows:

- Block A – comprising ground floor restaurant with 17 residential units above
- Block B – comprising existing retail at ground floor with 4 residential units above existing residential
- Block C – comprising existing retail at ground floor with proposals for restaurant and cinema above
- Block D – comprising existing retail at ground floor with 19 residential units above
- Block E – proposed extension to existing Waitrose Store

In addition to the above, proposals are to redevelop the existing car parking to the rear of the site, to include a single deck car park.

The following Figure [extract from Barton Willmore drawing PA-102 shows the extent of the proposed development and location of each block]:

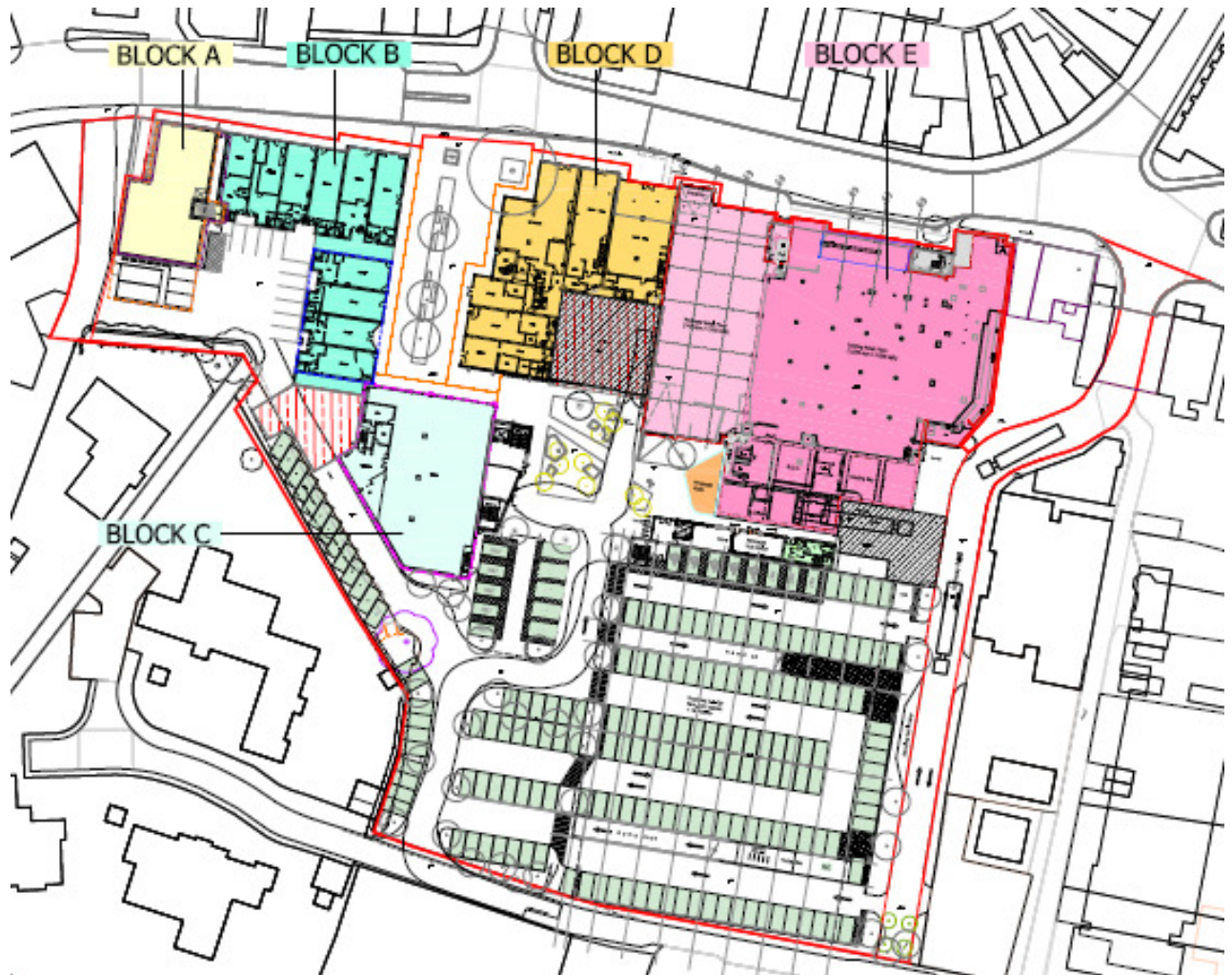


Figure 1 - Proposed layout showing each Block

The purpose of this Report is to as follows:

- to document existing ambient and background noise levels around the site;
- to provide a summary of good practice measures for the control of construction noise
- to assess the potential noise impact from the proposed development on existing noise sensitive premises
- to assess the noise impact on proposed residential dwellings from existing noise sources
- to set limiting noise levels for new items of services plant associated with the development.

2. Design Criteria

2.1 Local Authority Planning Requirements

The requirements of Reading Borough Council [RBC] for the noise assessment are set out in an internal memo from Jodie Wilson, Senior Environmental Health Office, to Stephen Vigar, dated 24th December 2013 [appended to this Report in Section 9]. In addition, the noise impact assessment requirements were discussed with Jodie on 23rd May 2014 and set out in an email [copy appended to this report in Section 9] from the author to Jodie on 27th May 2014.

2.1.1 Noise impact on residential development

Reading Borough Council's noise policy for new build residential development is for internal ambient noise levels to be designed to meet the 'good' criteria within the 1999 version of British Standard 8233 [BS 8233]. These are summarised in the following Table:

Room	Design criteria ['good']
Bedrooms	$\leq 30 \text{ dB } L_{Aeq,T}$
Living rooms	$\leq 30 \text{ dB } L_{Aeq,T}$
Gardens and balconies	$\leq 50 \text{ dB } L_{Aeq,T}$

Table 1 - Internal noise criteria for new build residential development

Received correspondence from RBC confirms that the above requirements are based on British Standard 8233:1999 and the World Health Organisation Community Guidelines. BS 8233: 1999 has been superseded in February 2014. The 2014 version retains the 'good' criteria for residential developments, but removes the upper 'reasonable' range. There is also no reference to a maximum criteria is either RBCs correspondence or the new BS 8233: 2014.

Glazing will be specified to provide appropriate sound insulation properties to see that the above internal noise levels can be achieved, in addition to comments made on the anticipated maximum noise impact [in line with BS 8233:1999].

With regards ventilation, it is understood that "*Ventilation measures should be selected which do not allow unacceptable noise ingress and should provide sufficient ventilation to avoid the need to open windows in hot weather, however non-openable windows are not considered an acceptable solution due to the impact on living standards.*"

2.1.2 Noise arising from commercial / industrial development

Any new items of services plant associated with the development should be designed and installed such that the rating level is no greater than 10 dB below the existing background $[L_{A90,T}]$ noise level. The assessment is based on the methodology set out in BS 4142: 1977.

2.1.3 Noise arising from ‘other’ sources

No specific guidance is given in respect of specific noise sources, such as from the car park or service yards. However, it is considered that the principles set out above [Sections 2.1.1 & 0] can be used. ‘Typical’ noise data for services yards and anticipated car park usage will be input into a 3D noise model to provide the average noise impact from such activities.

Similarly, no specific guidance has been provided for noise from the proposed cinema / restaurants, and therefore best practice measures have been included for within this report. It was noted by Jodie Wilson that opposite the site, there is an existing restaurant which opens its frontage during hot weather and at the time of writing no complaints of noise have been received.

3. Noise climate

Noise surveys have been carried out to establish the existing ambient and background noise levels around the site and to determine the noise impact on proposed residential dwellings. The measured noise levels have also been used to calibrate and verify a 3D noise map of the site that can more accurately assess noise propagation from multiple existing and proposed noise sources. The following sub-sections provide details on the noise surveys and 3D noise modelling.

3.1 Noise surveys

The following noise surveys were carried out:

- Daytime noise surveys were carried out between approximately 14:10 and 20:00 hours on 7th November 2013
- Night-time noise surveys were carried out between approximately 01:00 and 04:00 hours on 8th May 2014

Measurements were made with two CEL 633 Class 1 sound level meters [serial numbers 1211404 and 1211405]. Meters were field calibrated prior to, and immediately following measurements with no significant drift noted. Copies of relevant calibration certification can be supplied upon request.

All measurements were made on a tripod, in free field locations, approximately 1.5 m above ground floor level. Weather conditions for the duration of the surveys were dry, with no precipitation and <3m/s wind speeds.

Measurements were made concurrently of numerous noise descriptors, but the key factors used in this assessment are as follows:

- $L_{Aeq,T}$ – the average A-weighted noise level exposure over a given time period, T;
- $L_{A90,T}$ – the A-weighted noise level exceeded for 90% of the measurement period, T, commonly accepted as being the 'background' noise level;
- L_{Amax} – the maximum A-weighted noise level within a particular measurement period.

Figure 2 shows the red line site boundary with the indicative measurement locations marked.

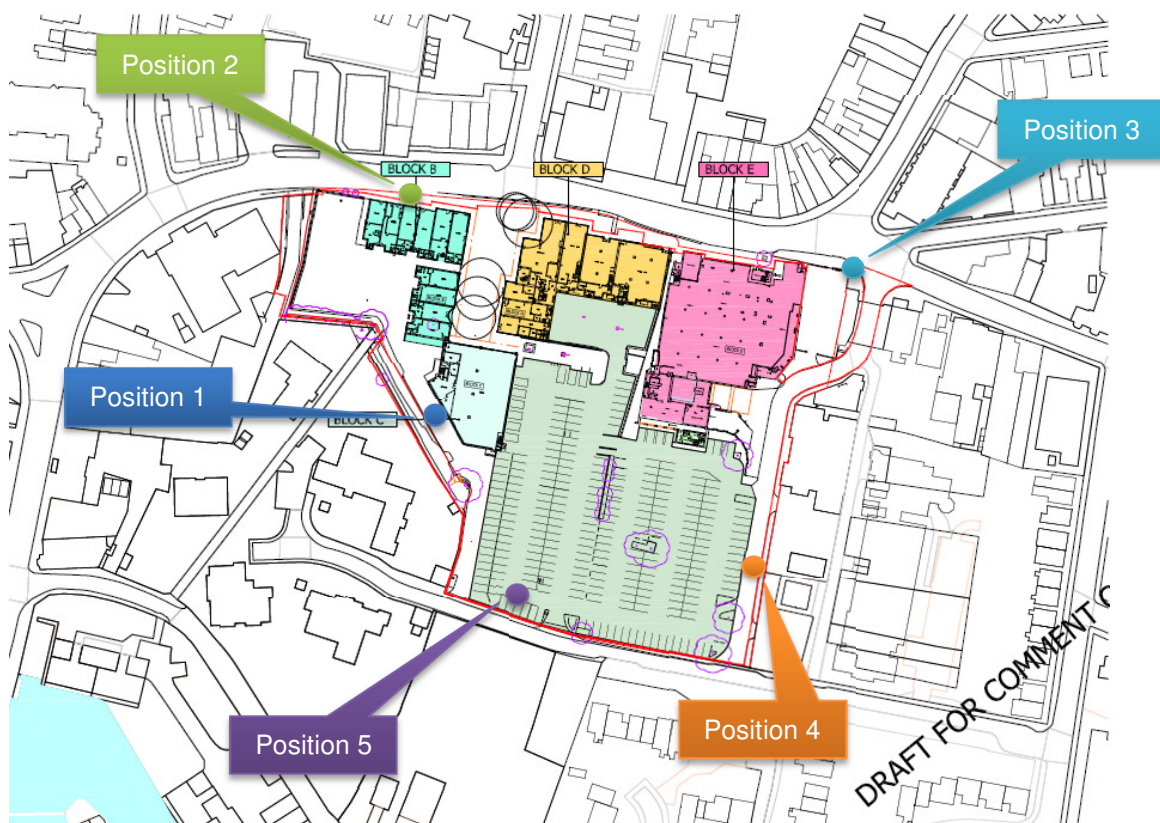


Figure 2 - Site plan showing indicative location of measurement positions

The following Table shows a summary of measurement results for each position. All values are in dBA. Detailed measurement results are shown in Section 8 below. All values shown are in dBA.

Measurement Position / Period		Averaged ¹ $L_{Aeq,T}$	L_{AFmax} ²	$L_{A90,T}$ ³
1	Daytime	51.3	77.3 [53 - 77]	47
2	Daytime	68.8	92.3 [75-92]	60
	Night-time	54.3	77.5 [46-77]	37
3	Daytime	68.1	96.7 [74-96]	67
4	Daytime	59.5	80.3 [66-80]	49
	Night-time	46.6	71.3 [48-71]	42
5	Daytime	54.2	75.3 [61-75]	45
	Night-time	47.6	70.8 [45-70]	41

Table 2 - Summary of measured noise levels

3.2 3D noise model

In order to accurately assess noise propagation across the site, a 3D noise model has been created, using SoundPlan [version 7.2]. The model has been calibrated using measured noise data around the site and also road traffic data provided by WYG. For service yards and car parks, typical activity noise levels have been used in the assessment.

Road traffic data has been provided by WYG in the form of Annual Average Daily Traffic figures for the following scenarios:

- 2014 Base – existing traffic levels around the site
- 2019 Base – projected traffic levels around the site with no development
- 2019 With development – projected traffic levels around the site with the development

¹ The logarithmically averaged noise measured during the period

² Highest L_{Amax} is shown with the range in brackets below

³ The typical background noise level is determined by taking the highest frequency density when plotted as a histogram. Where two distinct frequency ranges are evident [i.e. at positions 2 and 4, i.e. where daytime and evening background noise levels vary considerably], the lowest value is recorded.

4. Construction noise

During the construction period, some disturbance to noise sensitive properties is inevitable. The level of disturbance is however likely to reduce, particularly towards the end of the construction phase as internal works and fit-out would inherently be less obtrusive.

The contractor will be required to comply with the requirements of BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' and provide Reading Borough Council with a Construction Management Plan.

The following is good practice guidance for the management of construction noise and vibration, in addition to the guidance given and required by Reading Borough Council:

- Effective communication between the main contractor and nearby noise sensitive receptors (residential and commercial) outlining current and forthcoming activities, including timescales. For a development of this scale, a 'point of contact' with dedicated phone number and email address should be made available for queries and complaints. Effective communication is important in controlling adverse community reaction to noise
- Appropriate hours of noisy work adjacent to residential dwellings should be restricted to 08:00 to 18:00 hours Monday to Friday and 08:00 to 13:00 hours on Saturday, with no noise activities taking place on Sundays or Bank Holidays. Maximum permitted noise levels are 72 dBA $L_{Aeq,10hr}$ Monday to Friday and 72 dBA $L_{Aeq,5hr}$ Saturdays adjacent to residential dwellings
- Site vehicles should not be left idling, particularly when in close proximity to residential dwellings. This is also applicable to other site machinery, such as pumps, generators etc, which, if not in use, should be shut down
- Over-revving of works vehicles should be avoided and site access should be configured to minimise disruption
- Site hoarding should be installed to provide barrier attenuation against noise. To be effective, the barrier should block the line of sight between the noise source and receptor, and screens are more effective closer to the noise source. Site hoarding can also be used as an effective communication tool if details of the construction programme and activities are placed on the hoarding. Transparent screens can be used to allow a visual appreciation of on-going works
- Careful selection of plant and machinery should be made to minimise noise impact and all items of plant and machinery should be well maintained in accordance with the manufacturer's instructions. Where feasible, appropriate silencers should be used to reduce noise levels at source
- Constant monitoring of activities and noise levels around the site will be required to identify areas where any additional mitigation measures could be employed.

- Careful consideration will be required for the use of heavy equipment, particularly piling equipment to reduce vibration impact on nearby persons, such as auger driven piling as opposed to impact piling, where feasible

5. New development near existing dwellings

The following sub-sections detail the mitigation measures to be employed to control noise breakout from the proposed development. This section is split into the following Sections:

- Predicted noise impact from road traffic [roads, deliveries and car parks]
- Control of noise breakout from A1/A3 units and Cinema
- Control of noise from fixed services plant

5.1 Existing noise sensitive properties

The site is within an established commercial / residential area. The following Figure highlights the existing residential areas surrounding the site in green:

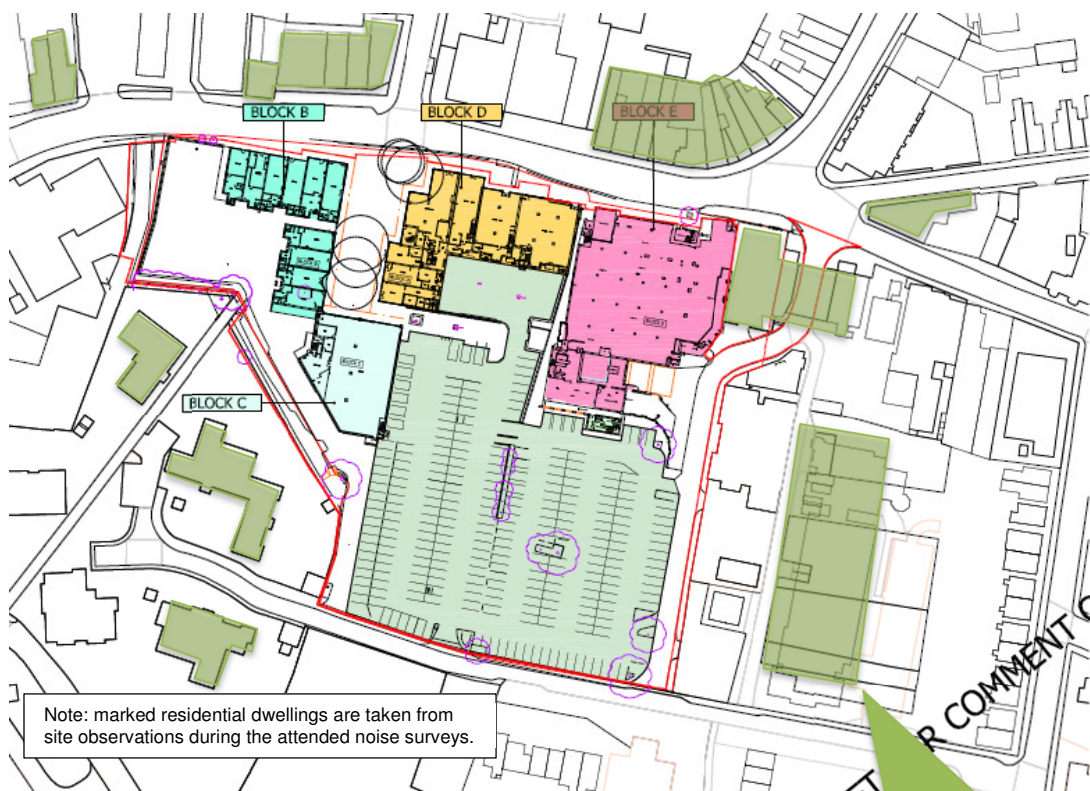


Figure 3 - Location of existing residential dwellings to the site

5.2 Predicted noise impact from road traffic

WYG have provided traffic flow data for the major roads surrounding the site. Data has been provided in the form of Annual Average Daily Traffic [AADT] figures for the following scenarios:

- 2014 Base – existing traffic levels around the site

- 2019 Base – projected traffic levels around the site with no development [based on natural increase in road traffic]
- 2019 With development – projected traffic levels around the site with the development [based on anticipated traffic flows due to natural increases in road traffic plus additional traffic attributable to the proposed development⁴]

In order to assess the potential noise impact from road traffic noise, four residential receptors have been assessed along the major routes into the precinct. These receptors are shown in the following Figure in green:

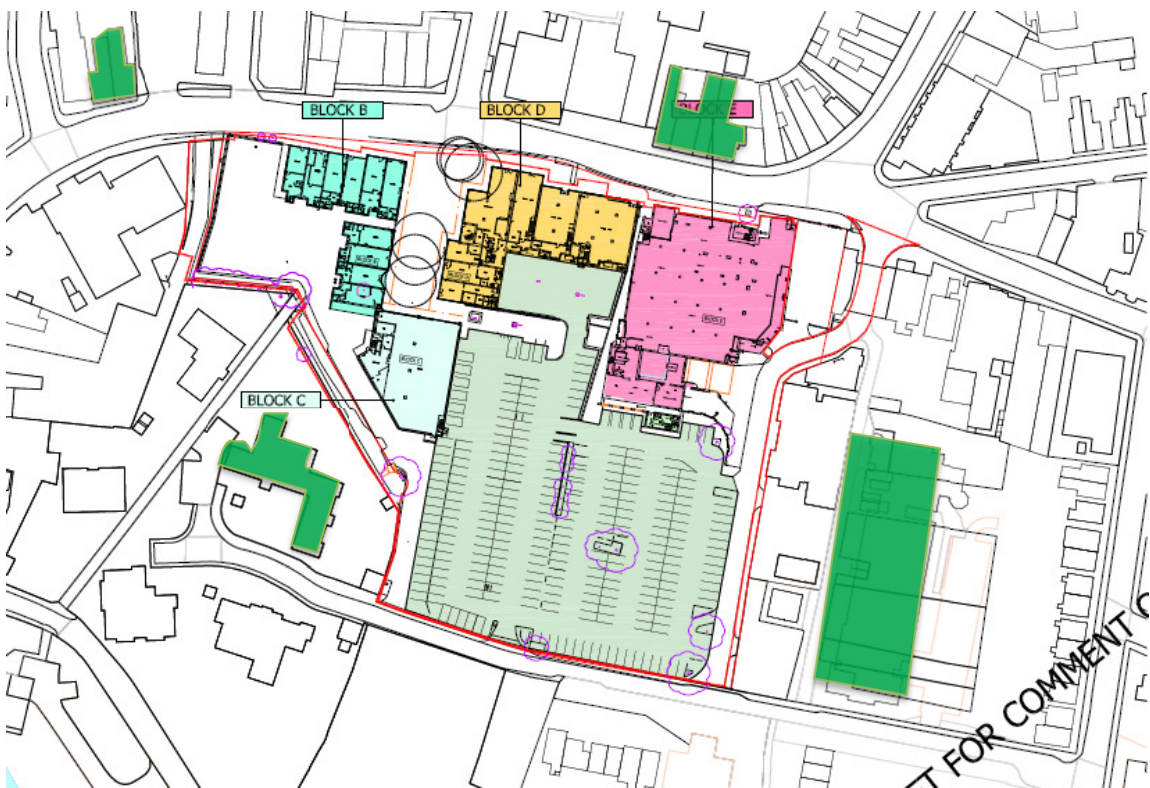


Figure 4 - Location of receivers for road traffic assessment

For each receptor highlighted above, the change in noise level has been assessed and these levels compared to the suggested significance criteria as set out in the Design Manual for Roads and Bridges [DMRB], Volume 11 Section 3.

For each receptor, the noise impact was assessed at each floor level, however, only the worst case change in noise level is shown. Usually, noise levels from a 3D noise model would be rounded to the nearest integer, however, for the purposes of comparing noise levels for a DMRB assessment, values to 0.1 dB are used.

⁴ This includes increase in deliveries/collections associated with service yards [see Section 6.1.2 for details]

The following Table summarises the results from the assessment. In addition to the predicted noise impact, the magnitude of change in noise level is also shown in brackets. For ease of reference, the magnitude of change in noise level is also colour coded, as follows:

Change in noise level	Significance criteria ⁵
0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0 +	Major

Figure 5 - Classification of magnitude of noise impact [short term]

Receptor	2014 Base [existing traffic levels around the site]		2019 Base [projected traffic levels around the site with NO development]		2019 With development [projected traffic levels around the site with the development]	
	Day	Night	Day	Night	Day	Night
Abbotsmead Place	67.9	61.0	68.1 [0.2]	61.5 [0.5]	68.1 [0.0]	61.5 [0.0]
14-16 Church Street	69.8	62.9	70.0 [0.2]	63.4 [0.5]	70.0 [0.0]	63.5 [0.1]
36a-40 Church Street	50.6	41.9	50.7 [0.1]	42.3 [0.4]	50.6 [0.0]	42.3 [0.0]
Crayshaw Court Retirement Village	50.6	43.0	50.7 [0.1]	43.3 [0.3]	52.1 [1.4]	43.6 [0.3]

Table 3 - Predicted increase in road traffic flow noise

The change in noise levels shown equate to:

- the difference between the 2014 and 2019 traffic levels, assuming natural increases in traffic around the site [No Development].
- the difference between the 2019 'No Development' and 2019 'With development' traffic levels

As can be seen from the above Table, the majority of receptor points show that the potential noise impact from increased traffic flows will be 'Negligible' or 'No change'. A 'Minor' change [+1.4 dB] is

⁵ Table 3.1 from DMRB

noted between the 2019 Base data [No Development] and the 2019 With Development data for Crayshaw Court Retirement Village. The predominant reason for this is the proposed changes to the car park to the rear of the development.

It is noted, with reference to the Grid Noise Maps below, that the noise impact on some residential dwellings will reduce due to the proposed Block A providing a barrier between Church Street and residential blocks to the south.

To put the change in noise levels above into context, traffic levels would have to double for a 3 dB increase in noise levels to be noted.

The following Figures show the predicted noise impact from changes in traffic flows from the 3D noise model. Each grid noise map is for daytime periods and at 1.5 m above ground level.

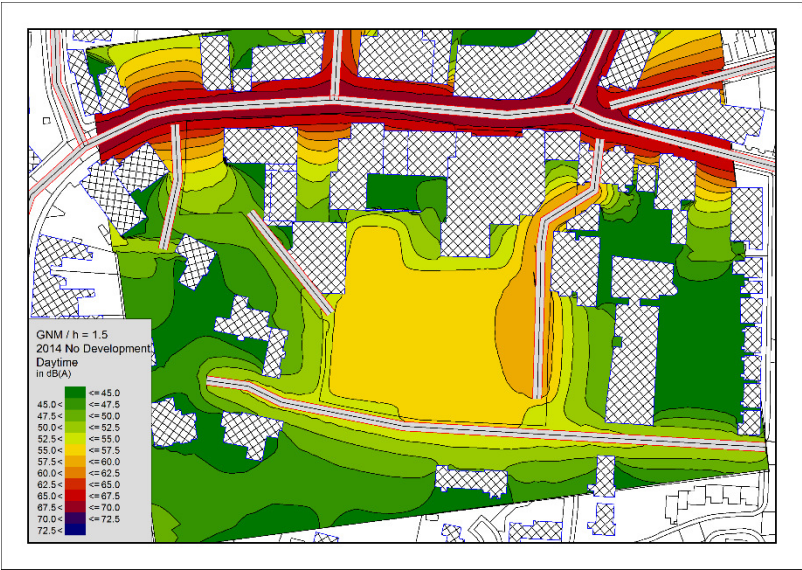


Figure 6 - Grid Noise Map showing noise propagation for 2014 No Development scenario



Figure 7 - Grid Noise Map showing noise propagation for 2019 No Development scenario



Figure 8 - Grid Noise Map showing noise propagation for 2019 With Development scenario

5.3 Control of noise breakout from A1/A3 units and Cinema

5.3.1 Cinema

At the time of writing, the cinema operator is unknown [Block C]. Experience has shown however, that most cinema operators have stringent requirements for the control of noise break-in to such an extent that noise break-out is adequately controlled. For example, typical noise intrusion into an auditorium would be $< \text{NR30 } L_{10}/L_{\text{max}}$ ⁶.

To see that noise breakout is adequately controlled however, the following Tables show:

- Typical internal noise level within auditoria [amplified film sound track⁷]

Octave band frequency, Hz	31	63	125	250	500	1000	2000	4000	8000
$L_{\text{Max,fast}}$	105	110	105	100	100	100	100	95	90
$L_{\text{eq,1hr}}$	85	95	85	85	85	85	80	80	75

Table 4 - Typical internal noise levels within Cinema Auditoria

- Noise level not to be exceeded [low frequency octave band and broad band values] at 1 m from the nearest residential dwelling [values based on measured background noise levels, refer to Table 2]

Octave band frequency, Hz	50	63	80	100	125	160	Broad band
Daytime $L_{90,5\text{min}}$	51	51	50	49	49	46	45
Night-time $L_{90,5\text{min}}$	47	47	46	45	45	42	41

Table 5 - Limiting noise levels for breakout noise from the cinema

5.3.2 A1 / A3 units

Further to discussions with Jodie Wilson, it is understood that there are few concerns for noise breakout from A1 / A3 units. This is based on the site currently in use with both A1 and A3 units, including other such units in the immediate vicinity.

It is recommended that a tiered approach to noise mitigation be adopted by future tenants, to see that the noise impact is adequately controlled. The following Table shows suggested mitigation measures, depending on the use and likely internal activity noise levels:

⁶ Example taken from two commercial cinema operators

⁷ Values taken from commercial cinema operator

A1 / A3 Internal activities	Mitigation measures
A1 or A3 units with no amplified music / background music, including patron noise	Any new glazing to shop frontages, including doors, to provide ≥ 25 dB R_w
A1 or A3 units with [louder] amplified music Amplified music limited to 90 dB $L_{Aeq,10mins}$ and 105 dB L_{Amax} during normal operation	Internal noise limiter for amplified music calibrated to the limits set Glazing and doors to shop frontages to provide ≥ 40 dB R_w
External seating areas	No amplified music Time restrictions from 08:00 to 23:00 hours Management policy per tenancy on the control of 'noisy/rowdy' behaviour

Table 6 - Suggested mitigation measures for control of noise breakout from A1/A3 units

5.4 Control of noise from fixed services plant

There will be a number of dedicated services plant rooms/locations associated with the development to serve the retail units and cinema, in addition to smaller plant to service the residential areas of the development.

Services will be split between general landlord's plant and tenant plant. At the time of writing, the plant selection is unknown, and therefore this report sets out the criteria to be achieved.

In accordance with Reading Borough Council's noise policy, services plant should be designed such that the 'rating'⁸ noise level is at least 10 dB below the existing ambient background noise levels when measured at the nearest noise sensitive receptors.

The background noise level [$L_{A90,T}$] was measured around the site at five locations, for both daytime and night-time periods. For each position, the 'typical' background noise level has been determined as the highest frequency density from plotting a histogram of measured noise levels.

The background noise levels around the site varied considerably. The following Figure therefore shows proposed limiting noise levels for services plant around the site, depending on the measured noise data.

The limiting noise levels should apply to all new items of service plant running simultaneously, including both landlord's and tenant's. More detailed calculations / division of noise limits will be applied when services plant locations and likely noise levels are determined.

⁸ The rating level, as described in BS 4142: 1997, is the specific noise level plus any adjustment for the characteristic features of the noise.

	Daytime	Night-time
Measured noise level	60 dBA	37 dBA
Limiting noise level	50 dBA	27 dBA

	Daytime	Night-time
Measured noise level	67 dBA	37 dBA
Limiting noise level	57 dBA	27 dBA



	Daytime	Night-time
Measured noise level	45 dBA	41 dBA
Limiting noise level	35 dBA	31 dBA

	Daytime	Night-time
Measured noise level	49	42
Limiting noise level	39	32

6. New dwellings proposed near existing noise sources

An assessment has been made of the required sound reduction properties for glazing and ventilation for proposed new build residential elements of the development.

The following Figure shows the proposed site plan with residential areas marked on.

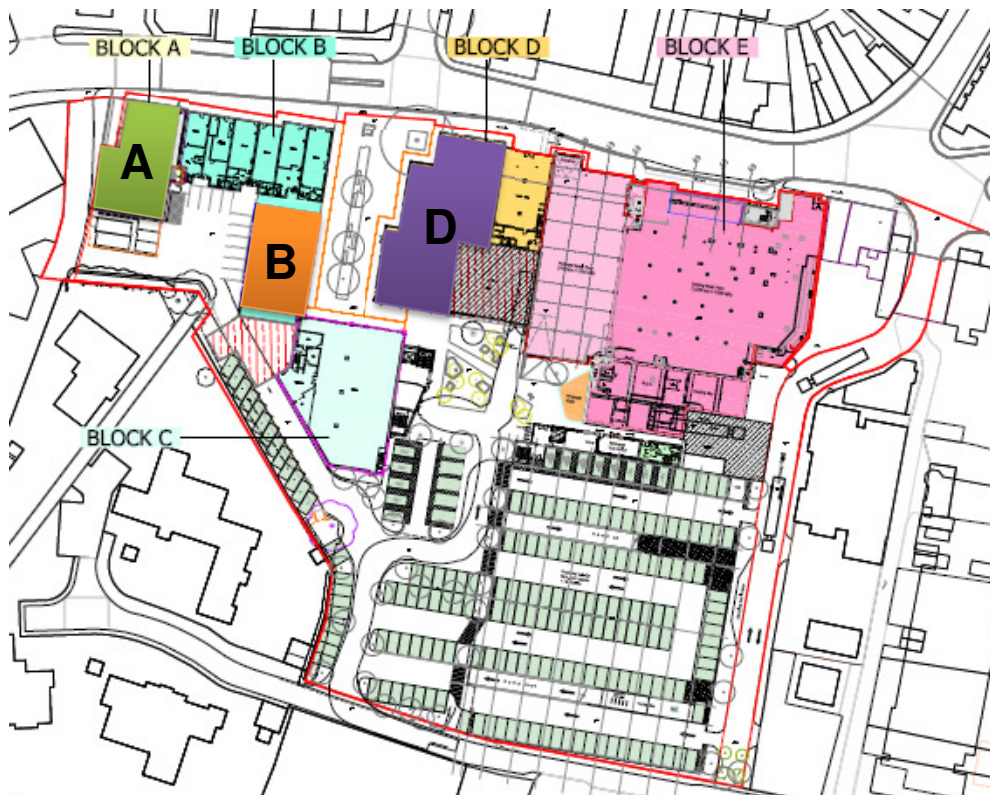


Figure 9 - Site plan showing location of proposed residential

6.1 Noise sources affecting proposed residential dwellings

The potential noise sources that will impact on the proposed residential elements of the development are road traffic [on the surrounding road network and within the car parks] and from service yard noise. These will be discussed below:

6.1.1 Vehicular noise

The predicted noise impact on proposed residential dwellings attributable to vehicular traffic has been assessed using the 3D noise model. Traffic data for the 2019 With Development scenario has been used, which will provide the worst case noise impact [i.e. the natural increase in road traffic over the next 5 years and the increase in traffic levels attributable to the development].

6.1.2 Service yards

The following Figure shows existing and proposed service yards associated with the development:

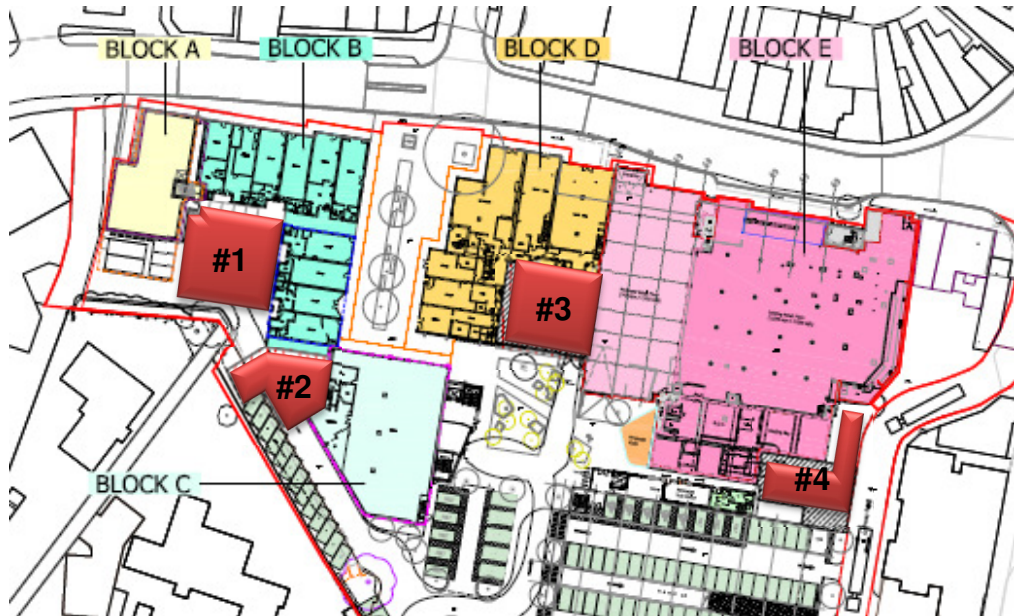


Figure 10 - Service yard locations

All of the above service yards are existing. As part of the development proposals, the following changes are proposed:

- **Service Yard #1** – this area is currently a car park and will predominantly be used as such under the proposed scheme. However, to service the proposed Pizza Express it is understood that a number of deliveries are required, including the following:
 - Fresh Food, 3 times per week, Mon-Sat, 18t vehicle, contractual delivery hours are Midnight to Noon but the majority of deliveries take place between Midnight and 6am.
 - Frozen/Drinks , twice per week, Mon-Sat, between the hours of 8am to 7pm, 18/26t vehicle
 - Waste Collection - 6 days per week, 10 am to 2 pm, 18t vehicle
 - Non Food, fortnightly, Mon-Fri, 8am to 6pm, 7.5t vehicle

This service yard will be accessed from Abbotsmead Place to the south, with egress onto Church Street to the north, as shown in the following Figure:



Figure 11 - Swept path analysis for Service Yard #1 [proposed Pizza Express]

Other items within service yard #1 would include bins and condenser units⁹.

- **Service Yard #2** – this area is currently used to service Block C and includes deliveries and bins. The number of deliveries may increase due to the increase in commercial demises, however, as above, this is anticipated to be no greater than two vans or a single 7.5t lorry per day.
- **Service Yard #3** – this service yard is existing and currently enclosed by a 3 m solid boundary enclosure. It is understood¹⁰ that the existing equipment is to be retained, although rearranged as part of the development works. The anticipated number of vehicular deliveries is one fresh food 18t HGV three times a week (Mon-Sat), one 18/26t HGV twice a week (Mon-Sat) for frozen/drinks, one 18t waste collection lorry six days a week and one non-food 7.5t lorry fortnightly (Mon-Fri)¹¹.
- **Service Yard #4** – this service area is existing and will not undergo any known changes. There is potential for increased deliveries due to the increase in net area for the Waitrose Store, although due to its well shielded nature, this is not anticipated to have any impact on proposed residential dwellings.

6.2 Predicted noise impact

Since the daytime noise impact is considerably greater than the night-time impact, and the daytime and night-time noise criteria are the same, the glazing and ventilation attenuation requirements will be dictated by the daytime noise impact. The following Figures therefore show the predicted daytime noise impact on proposed residential elevations.

⁹ Refer to Section 5.4 for control of noise from fixed services plant

¹⁰ Based on discussion with the Highways Consultant

¹¹ Delivery durations have been modelled as taking up to 1 hour.

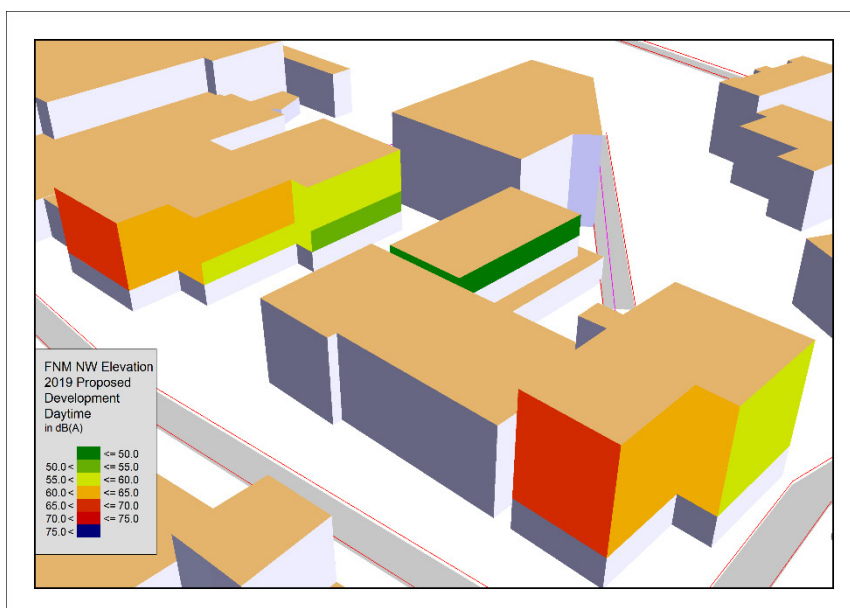


Figure 12 – Façade Noise Map showing predicted noise impact on proposed residential dwellings [view from north west]

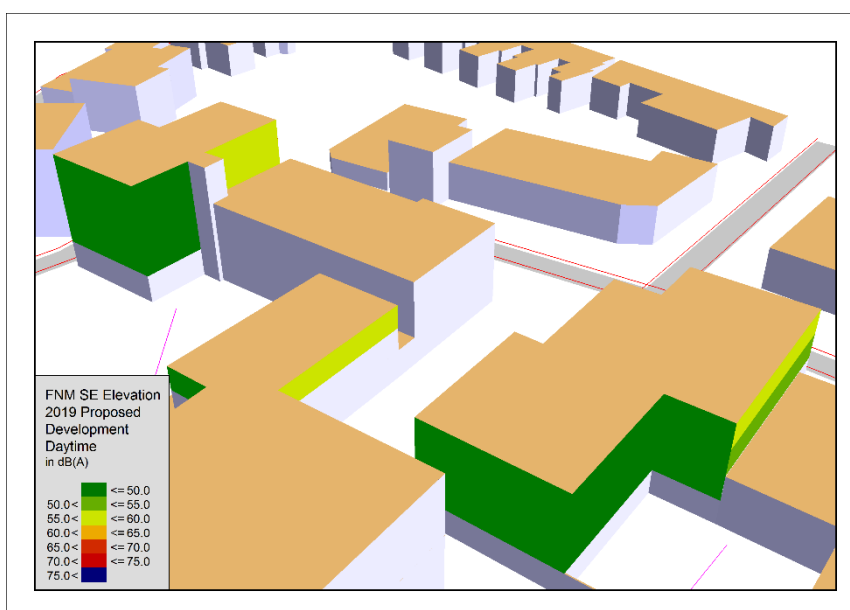


Figure 13 – Façade Noise Map showing predicted noise impact on proposed residential dwellings [view from south east]

The predicted noise impact shown in the above Figures is the daytime average [$L_{Aeq,18hr}$] noise level. As noted, this includes the projected 2019 With Development traffic flows and anticipated deliveries.

6.3 Glazing and ventilation attenuation requirements

Based on the predicted noise impacts above, the following Table shows the required glazing and ventilation sound attenuation requirements to achieve the 'good' internal noise criteria, as per BS 8233:1999. The glazing sound attenuation requirements are quoted in terms of $R_w + C_{tr}$, the C_{tr} providing a correction for road traffic noise which is the dominant noise source to affect façades. Ventilation attenuation requirements apply to all penetrations through the façade and are denoted $D_{n,e,w} + C_{tr}$.

Predicted noise impact on façade	Glazing sound attenuation	Suggested configuration	Ventilation
< 55 dB	$\geq 25 \text{ dB } R_w + C_{tr}$	Standard thermal double glazing	No acoustic rating
> 55 to $\leq 60 \text{ dB}$	$\geq 30 \text{ dB } R_w + C_{tr}$	10 mm pane 16 mm air gap 4 mm pane	36 dB $D_{n,e,w} + C_{tr}$
> 60 to $\leq 65 \text{ dB}$	$\geq 35 \text{ dB } R_w + C_{tr}$	6 mm pane 16 mm air gap 10.8 mm Pilkington Optiphon	41 dB $D_{n,e,w} + C_{tr}$
> 65 to $\leq 70 \text{ dB}$	$\geq 40 \text{ dB } R_w + C_{tr}$	8.8 mm Pilkington Optiphon 16 mm air gap 12.8 mm Pilkington Optiphon	46 dB $D_{n,e,w} + C_{tr}$

Table 7 - Glazing attenuation figures, based on noise impact

It is considered that if new build residential areas are provided with the above mitigation measures, internal noise levels in line with RBCs requirements will be achieved.

The proposed glazing and ventilation is discussed in more detail below.

6.3.1 Glazing – L_{AFmax} levels from road traffic on Church Street

Based on measured noise data at Position 2, the most representative for road traffic along Church Street, maximum noise levels typically ranged from 46 – 78 dBA L_{AFmax} , with the highest recorded value being 92 dBA. The following Graph shows range of measured L_{AFmax} noise levels:

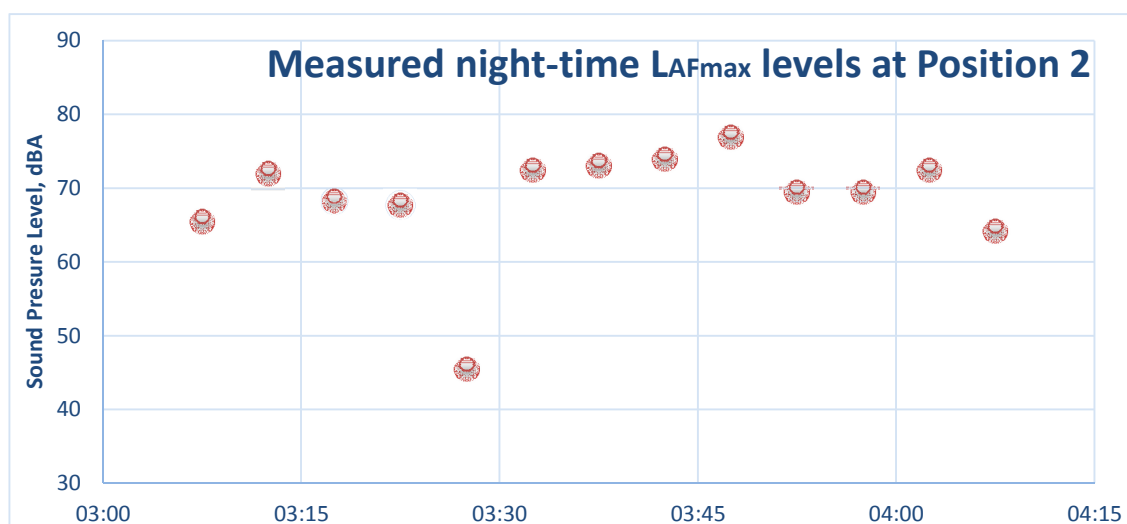


Figure 14 - Graph showing measured L_{AFmax} noise levels at Position 2

As can be seen, the maximum noise level measured at Position 2 are relatively high, which is to be expected adjacent to the very busy Church Street, which carries large volumes of traffic, including buses, HGVs etc.

Assuming the actual L_{AFmax} noise impact on the proposed residential façades will be between 3 dB lower than measured noise level, due to distance attenuation [measured noise levels were adjacent on the kerb adjacent to the road], it is anticipated that maximum noise levels, would be typically < 75 dBA. Based on the glazing attenuation above [40 dB $R_w + C_{tr}$], this would therefore result in L_{Amax} levels of < 35 dB within residential dwellings, which is significantly less than the 45 dB L_{AFmax} criteria set out in BS 8233:1999¹².

6.3.2 Glazing – L_{AFmax} levels from deliveries / collections

The predicted noise impact above included the anticipated number of deliveries and collections, as detailed in Section 6.1.2 above. The predicted noise impact however, is an average noise level, the $L_{Aeq,16hour}$. Based on only a few deliveries expected per day therefore, averaged over the 16-hour period, delivery noise should have no significant impact on the overall noise exposure.

However, each delivery will create a transient increase in the noise impact on nearby existing and proposed residential façades, as shown in the following Figure. Based on the information in Section 6.1.2, a worst case scenario may result in a maximum of five deliveries within a 24-hour period, although most days, this would only be 2-3 [up to one within the night-time period]. These instantaneous noise events would be limited to 20-30 second durations. To minimise the noise impact, it is recommended that vehicles making deliveries within Service Yard #1 do not have their engines idling during the loading/off-loading period.

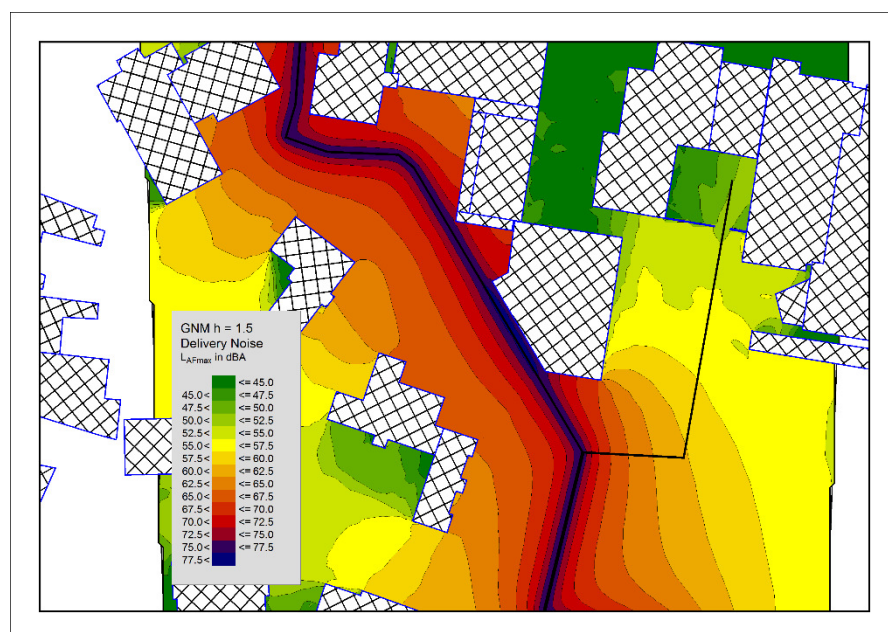


Figure 15 - Predicted L_{AFmax} noise level for delivery vehicles

¹² As noted above, BS 8233: 1999 has been superseded in February 2014. The 2014 version does not include a L_{AFmax} criteria for residential dwellings.

It is noted that a number of small van deliveries already use this route for loading/unloading Service Yard #2.

6.3.3 Ventilation details

In relation to meeting the requirements of Part F¹³ of the Building Regulations, proposals are for the minimum fresh air requirements [whole building / dwelling ventilation and extract ventilation from wet rooms] to be met through mechanical ventilation [e.g. Whole House Ventilation or Mechanical Ventilation Heat Recovery (MVHR)].

Purge ventilation¹⁴ and the control of summertime overheating would be met through openable windows.

¹³ Building Regulations Approved Document F: Means of Ventilation

¹⁴ Purge ventilation is described in AD-F as “...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. Conclusions

An assessment has been carried out to assess the potential noise impact the proposed regeneration of the St Martin's Precinct will have on nearby noise sensitive premises. The assessment also addresses the noise impact on proposed new residential dwellings.

Noise levels have been measured around the site and these, in conjunction with traffic count data, have been used to create a 3D noise model of the site to accurately predict noise propagation across the complex site from numerous noise sources.

Based on anticipated increases in traffic flows for the year 2019, with and without the development, there are no significant increases in noise levels anticipated that would adversely affect existing nearby residential dwellings.

Glazing and ventilation attenuation requirements for new build residential dwellings have been set, with suggested glazing specifications and ventilation solutions.

Limiting noise levels for new items of services plant have been set, based on the 'typical' background noise levels measured around the site.

The noise assessment for the regeneration of the St Martin's precinct has not highlighted any significant new noise sources, and it is considered that the existing noise climate [and predicted future vehicular noise], does not preclude residential development within this areas, provided the appropriate mitigation measures set out herein are included.

8. Detailed measured noise data

The following Tables show detailed measurement results [L_{AFmax} , $L_{Aeq,5mins}$, $L_{A90,5mins}$] for each Position.

Position 1				Position 2			
Time	L_{AFmax}	$L_{Aeq,15mins}$	$L_{A90,5mins}$	Time	L_{AFmax}	$L_{Aeq,15mins}$	$L_{A90,5mins}$
14:12	63.2	48.3	47.0	14:46	81.6	69.2	66.5
14:17	59.4	47.6	47.0	14:51	86.7	68.0	65.5
14:22	68.1	49.8	46.5	14:56	87.0	71.0	67.5
14:27	53.9	46.6	46.5	15:01	83.8	71.0	68.0
14:32	63.3	47.6	46.5	15:06	87.7	69.8	66.0
14:37	68.9	47.9	46.0	15:11	92.3	71.0	67.0
15:23	71.1	54.0	50.0	15:58	81.3	65.4	58.5
15:28	66.1	52.3	50.0	16:03	90.6	67.1	57.0
15:33	77.3	54.8	50.0	16:08	75.2	64.7	58.0
15:38	64.6	52.4	50.5	16:13	76.7	64.4	58.0
15:43	76.1	57.4	50.0	16:18	84.1	67.4	60.0
15:48	56.1	47.0	44.5	16:23	83.4	67.4	59.5
17:04	70.6	52.0	49.0	17:36	81.3	69.3	68.0
17:09	58.8	48.5	48.0	17:41	78.0	68.7	67.5
17:14	76.0	55.7	47.0	17:46	86.4	70.0	66.5
17:19	59.9	49.0	47.0	17:51	89.1	70.1	68.0
17:24	65.1	48.9	48.0	17:56	84.9	69.4	68.0
17:29	69.1	53.0	48.0	18:01	80.2	68.8	67.5
18:26	58.1	49.1	45.5	18:59	80.4	67.7	61.0
18:31	64.9	47.8	45.5	19:04	78.1	68.1	57.0
18:36	61.4	47.1	45.5	19:09	78.5	67.7	59.5
18:41	60.4	48.6	46.5	19:14	75.1	67.5	61.5
18:46	65.2	48.5	47.0	19:19	89.4	70.5	60.5
18:51	58.4	48.9	45.5	19:24	79.1	67.8	60.5

Position 3				Position 4			
Time	L _{AFmax}	L _{Aeq,15mins}	L _{A90,5mins}	Time	L _{AFmax}	L _{Aeq,15mins}	L _{A90,5mins}
15:20	86.2	70.3	68.0	14:14	75.3	59.1	48.5
15:25	85.5	69.5	67.0	14:19	69.4	58.2	49.0
15:30	87.2	68.1	66.0	14:24	68.7	57.7	48.5
15:35	80.0	67.8	66.5	14:29	69.6	55.7	47.5
15:40	78.7	67.1	66.0	14:34	68.2	57.1	47.5
15:45	78.3	66.9	65.0	14:39	75.8	60.7	48.5
16:34	83.0	69.1	64.0	15:55	75.6	60.3	53.5
16:39	84.0	68.3	63.0	16:00	77.2	61.2	53.0
16:44	81.5	66.9	61.0	16:05	72.6	59.5	53.5
16:49	79.0	66.9	62.0	16:10	75.6	61.0	55.5
16:54	79.3	66.5	62.5	16:15	76.6	60.9	52.5
16:59	96.7	70.7	61.0	16:20	77.5	61.1	54.0
18:11	85.5	69.4	67.0	17:17	68.4	56.8	48.0
18:16	84.9	67.2	66.5	17:22	66.2	55.4	48.5
18:21	79.0	68.0	66.5	17:27	69.8	57.3	49.5
18:26	77.3	67.4	66.5	17:32	70.9	57.7	49.5
18:31	80.2	68.7	67.0	17:37	68.9	56.0	47.5
18:36	87.9	70.2	66.0	17:42	68.4	58.4	48.5
19:33	81.7	68.5	61.5	18:43	77.5	61.7	55.0
19:38	84.4	67.5	62.5	18:48	74.2	59.4	54.0
19:43	75.9	65.7	60.0	18:53	79.6	62.1	55.5
19:48	74.4	64.8	58.5	18:58	75.3	59.2	53.0
				19:03	76.4	61.6	55.0
				19:08	80.3	60.4	55.0

Position 5			
Time	L _{AFmax}	L _{Aeq,15mins}	L _{A90,5mins}
14:48	64.2	52.9	45
14:53	64	52.5	44.5
14:58	67.3	53.4	45
15:03	64.5	51.4	45
15:08	70.8	55.5	48
15:13	64.5	52.3	45.5
16:32	73.8	57.1	50.5
16:37	69.5	56.1	52.5
16:42	73.8	53.5	50.5
16:47	74.3	55.7	50.5
16:52	68.8	54.6	48.5
16:57	66.4	54.4	50
17:52	71.1	54.9	45.5
17:57	64.9	52.2	45.5
18:02	72.6	55.5	46.5
18:07	63.7	50.2	44
18:12	69.6	53.8	45
18:17	70.4	52.5	44.5
19:14	67.6	54.1	48.5
19:19	75.3	56.8	49
19:24	67.4	53.1	47.5
19:29	73.1	54.2	48
19:34	61.7	51.2	49
19:39	65.4	54.4	51.5

9. Local Authority Liaison

The following internal email has been received which sets out the requirements for the noise assessment.



INTERNAL MEMORANDUM

To:	Stephen Vigar	Your Ref:	131711
From:	Jodie Wilson - Senior Environmental Health Officer	My Ref:	EP /481074
Date consultation received:	Date: 24 December 2013		

Application Number: 131711

Premises Address: St Martins Precinct, Church Street, Caversham

Application For: A comprehensive package of development and improvements to St Martin's Centre

Environmental Protection concerns

- Noise impact on development
- Noise arising from development
- Delivery hours
- Air Quality impact - increased exposure / new receptors
- Contaminated Land
- Light - external
- Odour and noise - kitchen extraction
- Construction and Demolition phase

Noise impact on development

I have concerns about noise impact on residents of the proposed development and would recommend a noise assessment to predict the impact of the development and the external environment on residents. Applications for proposed residential developments where there are obvious noise sources, such as road, rail, industry, town centre location etc should be accompanied by a noise assessment of the external noise environment, identifying noise mitigation measures as necessary. The noise sources of concern include road traffic, pedestrians, extraction and ventilation plant, cinema, car park, recycling bins / refuse bins and deliveries.

The noise assessment should identify the external noise levels impacting on the façade of the proposed dwellings. The external noise levels can be used to ensure that the design, particularly in terms of glazing and ventilation would control noise levels sufficiently to provide a good quality living environment.

We refer to BS 8233:1999 and the WHO guidelines for community noise which provide guidance on acceptable noise levels. We look at noise levels within bedrooms at night (23:00hrs-07:00hrs) and living rooms during the

day (07:00hrs to 23:00hrs) and external amenity space (gardens / balconies, etc). For new build, we expect that the design will meet the 'good' standard. Where a building is being renovated and/or is listed, the 'reasonable' standard might be acceptable, where the 'good' standard cannot be met.

Room	Design criteria (good)	Upper limit (reasonable)
Bedrooms	<30dB	<35dB
Living rooms	<30dB	<40dB
Gardens & Balconies	<50dB	<55dB

Noise mitigation is likely to focus on the weak point in the structure; glazing. Given that the acoustic integrity would be compromised should the windows be opened, ventilation details must also be provided, where mitigation relies on closed windows. Ventilation measures should be selected which do not allow unacceptable noise ingress and should provide sufficient ventilation to avoid the need to open windows in hot weather, however non-openable windows are not considered an acceptable solution due to the impact on living standards.

The design should reflect the findings of the noise assessment and incorporate the recommendations of the noise assessment, or equivalent, in terms of glazing and ventilation.

Noise arising from development

I have concerns about the impact of noise from the proposed development on nearby noise sensitive receptors. Potential noise sources include, extraction and ventilation plant associated with the commercial uses, noise breakout from the cinema and other leisure uses, and delivery noise.

We refer to BS4142:1997 when looking at the introduction of proposed noise generating equipment. BS4142:1997 is designed to assess the likelihood of noise complaints resulting from new plant, if permitted.

A noise assessment should be carried out following the methodology of BS4142:1997 and submitted with the application. The noise assessment would be carried out for the nearest noise sensitive receptor (usually a residential dwelling). In this case as there are potentially several potential receptor locations for several potential sources, the noise assessment should cover the worst affected resident for each location where noise sources are proposed to be placed.

The assessment provides the following classifications:

	Source 'rating' level (dB L _{dB})
Complaints likely	>10dB above background*
Marginal significance	5dB above background*
Complaints unlikely	>10dB below background*

'Background' refers to the background noise level without the noise source operating (dB L_{A90})

We would like to see the applicants demonstrate that complaints will be unlikely. In order to do this the applicants would have to ensure that the noise rating level was at least 10dB below the existing background level as measured at the nearest noise sensitive receptor.

Where the noise source is within 10dB of the existing background noise, the resulting background noise will increase. In a densely occupied area such as there in Caversham, it is important to ensure that new developments do not increase background noise levels. Increasing background noise levels results in an increasing benchmark against which new plant is introduced. Gradually the noise in an area could each time new plant is introduced. If all developments involving noise generating equipment achieve 'complaints unlikely', background noise levels would not be increased.

In order to meet the 'complaints unlikely' criteria, noise mitigation measures should be recommended and the noise assessment updated to reflect the mitigated noise source rating level.

A noise assessment should be submitted with the application to show that 'complaints unlikely' criteria will be met if the plant assessed is installed and detailing the mitigation measures required to achieve this.

The following confirmation email was sent from Tom Nightingale [Cundall] to Jodie Wilson, Senior Environmental Health Office at Reading Borough Council.

Nightingale, Tom

From: Nightingale, Tom
Sent: 27 May 2014 11:28
To: 'jodie.wilson@reading.gov.uk'
Cc: david.baker@workman.co.uk; Willcocks, Jake; Parkin, Andrew
Subject: St Martins Precinct, Caverham - Acoustic assessment

27/05/2014

Acoustic Report for St Martins Precinct, Caverham

Dear Jodie,

Thank you for the time last Friday to chat through the requirements for the acoustics report for the St Martins Precinct development.

We are in receipt of your comments to Stephen Vigar, dated 24/12/2013, which highlight the potential noise sources and your requirements for the assessment. In summary, please find below a schedule of our proposals, taking on board your comments to Stephen and our discussions.

We have completed the noise surveys at the site. The daytime noise surveys were carried out on 7th November [Thursday] 2013 approximately between 14:00 and 20:00 hours, i.e. daytime, rush-hour and early evening hours. The night-time survey was carried out more recently, on 9th May 2014, between approximately 01:00 and 04:15 hours.

With regards new build residential areas, the measured noise levels and traffic count data will be used in a 3D noise model of the site to predict the noise impact on each façade so that suitable glazing and ventilation can be proposed. The model will include 'typical' service yard activity noise to provide an average noise impact.

We note your criteria for new build residential as follows:

- Glazing to attenuate sound such that internal noise levels within bedrooms and living rooms are < 30 dBA $L_{Aeq,T}$
- Ventilation to be provided which does not compromise the external façade attenuation. Where the exposure dictates, ventilation to meet the minimum fresh air requirements of Part F [whole building/dwelling ventilation and extract ventilation to wet rooms] would be met through mechanical ventilation, such as MVHR. However, Purge ventilation and the control of summertime overheating would be met through openable windows.

New items of services plant will be designed to achieve 10 dB below existing typical background [$L_{A90,T}$] noise levels, as per your guidance.

With regards noise breakout from commercial/entertainment parts of the development, we note the following:

- Typically, cinema specifications require a high level of sound attenuation against noise break-in which conversely provides good protections against noise break-out, however, this will be addressed in the report.
- With regards noise breakout from retail/restaurant etc. we will address the potential for noise breakout in relation to the nearest noise sensitive receptors, control of amplified music and management control [music and patrons etc.].

We welcome any additional comments you may have and trust that the above accurately reflects our conversation.

Best regards,

Tom



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